3Com® Stackable Switch Family
Advanced Configuration Guide

3Com Switch 5500
3Com Switch 5500G
3Com Switch 4500
3Com Switch 4200G
3Com Switch 4210

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Conserving energy, materials and natural resources in all operations.

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CONTENTS

About This Guide

Provides advanced configuration examples for the 3Com stackable switches, which includes the following:

- 3Com Switch 5500
- 3Com Switch 5500G
- 3Com Switch 4500
- 3Com Switch 4200G
- 3Com Switch 4210

This guide is intended for Qualified Service personnel who are responsible for configuring, using, and managing the switches. It assumes a working knowledge of local area network (LAN) operations and familiarity with communication protocols that are used to interconnect LANs.

ℹ *Always download the Release Notes for your product from the 3Com World Wide Web site and check for the latest updates to software and product documentation:*

`http://www.3com.com`

Conventions

Table 1 lists icon conventions that are used throughout this guide.

Table 1 Notice Icons

Icon	Notice Type	Description
ℹ	Information note	Information that describes important features or instructions.
⚠	Caution	Information that alerts you to potential loss of data or potential damage to an application, system, or device.
⚡	Warning	Information that alerts you to potential personal injury.

Related Documentation

The following manuals offer additional information necessary for managing your Stackable Switch. Consult the documents that apply to the switch model that you are using.

- *3Com Switch Family Command Reference Guides* — Provide detailed descriptions of command line interface (CLI) commands, that you require to manage your Stackable Switch.

- *3Com Switch Family Configuration Guides*— Describe how to configure your Stackable Switch using the supported protocols and CLI commands.
- *3Com Switch Family Quick Reference Guides* — Provide a summary of command line interface (CLI) commands that are required for you to manage your Stackable Switch .
- *3Com Stackable Switch Family Release Notes* — Contain the latest information about your product. If information in this guide differs from information in the release notes, use the information in the *Release Notes*.

These documents are available in Adobe Acrobat Reader Portable Document Format (PDF) on the 3Com World Wide Web site:

```
http://www.3com.com/
```

Products Supported by this Document

Table 2 Supported Products

Product	Orderable SKU	Description
4210	3CR17331-91	Switch 4210 9-Port
4210	3CR17332-91	Switch 4210 18-Port
4210	3CR17333-91	Switch 4210 26-Port
4210	3CR17334-91	Switch 4210 52-Port
4210	3CR17341-91	Switch 4210 PWR 9-Port
4210	3CR17342-91	Switch 4210 PWR 18-Port
4210	3CR17343-91	Switch 4210 PWR 26-Port
4500	3CR17561-91	Switch 4500 26-Port
4500	3CR17562-91	Switch 4500 50-Port
4500	3CR17571-91	Switch 4500 PWR 26-Port
4500	3CR17572-91	Switch 4500 PWR 50-Port
5500	3CR17161-91	Switch 5500-EI 28-Port
5500	3CR17162-91	Switch 5500-EI 52-Port
5500	3CR17171-91	Switch 5500-EI PWR 28-Port
5500	3CR17172-91	Switch 5500-EI PWR 52-Port
4200G	3CR17660-91	Switch 4200G 12-Port
4200G	3CR17661-91	Switch 4200G 24-Port
4200G	3CR17662-91	Switch 4200G 48-Port
4200G	3CR17671-91	Switch 4200G PWR 24-Port
5500G	3CR17250-91	Switch 5500G-EI 24 Port
5500G	3CR17251-91	Switch 5500G-EI 48-Port
5500G	3CR17252-91	Switch 5500G-EI PWR 24-Port
5500G	3CR17253-91	Switch 5500G-EI PWR 48-Port

1 LOGIN CONFIGURATION GUIDE

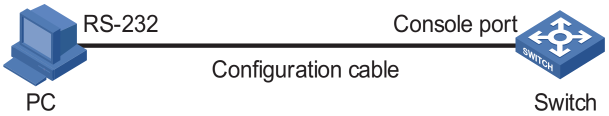
Unless otherwise specified, all the switches used in the following configuration examples and configuration procedures are Switch 5500 (release V03.02.04).

Logging In from the Console Port

You can log in locally from the console port to configure and maintain your switch, including configuring other login modes. The default login mode on the Switch 5500 is local console login.

Network Diagram

Figure 1 Logging in from the console port to configure Telnet login



Networking and Configuration Requirements

As shown in Figure 1, use a console cable to connect the serial port of your PC/terminal to the console port of the switch. Log into the switch from the AUX user interface on the console port to configure Telnet login. The current user level is manage level (level 3).

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

- Configure common attributes for Telnet login

# Set the level of commands accessible to the VTY 0 user to 2.

```
[3Com] user-interface vty 0
[3Com-ui-vty0] user privilege level 2
```

# Enable the Telnet service on VTY 0.

```
[3Com-ui-vty0] protocol inbound telnet
```

# Set the number of lines that can be viewed on the screen of the VTY 0 user to 30.

```
[3Com-ui-vty0] screen-length 30
```

# Set the history command buffer size to 20 for VTY 0.

```
[3Com-ui-vty0] history-command max-size 20
```

# Set the idle-timeout time of VTY 0 to 6 minutes.

```
[3Com-ui-vty0] idle-timeout 6
```

- Configure an authentication mode for Telnet login

The following three authentication modes are available for Telnet login: none, password, and scheme.

The configuration procedures for the three authentication modes are described below:

1 Configure not to authenticate Telnet users on VTY 0.

```
[3Com] user-interface vty 0
[3Com-ui-vty0] authentication-mode none
```

2 Configure password authentication for Telnet login on VTY 0, and set the password to **123456** in plain text.

```
[3Com] user-interface vty 0
[3Com-ui-vty0] authentication-mode password
[3Com-ui-vty0] set authentication password simple 123456
```

3 Configure local authentication in scheme mode for login users.

# Create a local user named **guest** and enter local user view.

```
[3Com] local-user guest
```

# Set the authentication password to **123456** in plain text.

```
[3Com-luser-guest] password simple 123456
```

# Set the service type to Telnet and the user level to 2 for the user **guest**.

```
[3Com-luser-guest] service-type telnet level 2
[3Com-luser-guest] quit
```

# Enter VTY 0 user interface view.

```
[3Com] user-interface vty 0
```

# Set the authentication mode to scheme for Telnet login on VTY 0.

```
[3Com-ui-vty0] authentication-mode scheme
[3Com-ui-vty0] quit
```

# Specify the domain **system** as the default domain, and configure the domain to adopt local authentication in scheme mode.

```
[3Com] domain default enable system
[3Com] domain system
[3Com-isp-system] scheme local
```

Complete Configuration

- Telnet login configuration with the authentication mode being none

```
user-interface vty 0
 authentication-mode none
 user privilege level 2
 history-command max-size 20
 idle-timeout 6 0
 screen-length 30
 protocol inbound telnet
```

- Telnet login configuration with the authentication mode being password

```
user-interface vty 0
 user privilege level 2
 set authentication password simple 123456
 history-command max-size 20
 idle-timeout 6 0
 screen-length 30
 protocol inbound telnet
```

- Telnet login configuration with the authentication mode being scheme

```
#
domain system
#
local-user guest
 password simple 123456
 level 3
#
user-interface vty 0
 authentication-mode scheme
 user privilege level 2
 history-command max-size 20
 idle-timeout 6 0
 screen-length 30
 protocol inbound telnet
```

Precautions

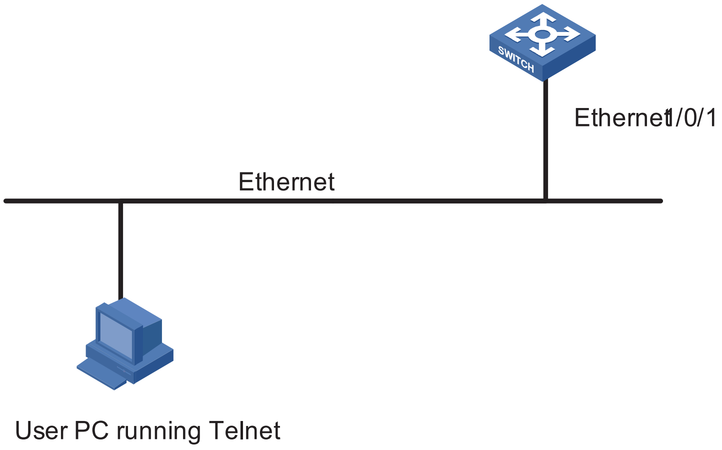
None

Logging In Through Telnet

You can telnet to your switch to manage and maintain it remotely.

Network Diagram

Figure 2 Telneting to the switch to configure console login



Networking and Configuration Requirements

As shown in Figure 2, telnet to the switch to configure console login. The current user level is manage level (level 3).

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

- Common configuration for console login

# Specify the level of commands accessible to the AUX 0 user interface to 2.

```
[3Com] user-interface aux 0
[3Com-ui-aux0] user privilege level 2
```

# Set the baud rate of the console port to 19200 bps.

```
[3Com-ui-aux0] speed 19200
```

# Set the number of lines that can be viewed on the screen of the AUX 0 user to 30.

```
[3Com-ui-aux0] screen-length 30
```

# Set the history command buffer size to 20 for AUX 0.

```
[3Com-ui-aux0] history-command max-size 20
```

# Set the idle-timeout time of AUX 0 to 6 minutes.

```
[3Com-ui-aux0] idle-timeout 6
```

- Configure the authentication mode for console login

The following three authentication modes are available for console login: none, password, and scheme. The configuration procedures for the three authentication modes are described below:

1 Configure not to authenticate console login users.

```
[3Com] user-interface aux 0
[3Com-ui-aux0] authentication-mode none
```

2 Configure password authentication for console login, and set the password to **123456** in plain text.

```
[3Com] user-interface aux 0
[3Com-ui-aux0] authentication-mode password
[3Com-ui-aux0] set authentication password simple 123456
```

3 Configure local authentication in scheme mode for console login.

# Create a local user named **guest** and enter local user view.

```
[3Com] local-user guest
```

# Set the authentication password to **123456** in plain text.

```
[3Com-luser-guest] password simple 123456
```

# Set the service type to Terminal and the user level to 2 for the user **guest**.

```
[3Com-luser-guest] service-type terminal level 2
[3Com-luser-guest] quit
```

# Enter AUX 0 user interface view.

```
[3Com] user-interface aux 0
```

# Set the authentication mode to scheme for console login.

```
[3Com-ui-aux0] authentication-mode scheme
```

Complete Configuration

- Console login configuration with the authentication mode being none

```
#
user-interface aux 0
 user privilege level 2
 history-command max-size 20
 idle-timeout 6 0
 speed 19200
 screen-length 30
```

- Console login configuration with the authentication mode being password

```
#
user-interface aux 0
 authentication-mode password
  user privilege level 2
 set authentication password simple 123456
 history-command max-size 20
 idle-timeout 6 0
 speed 19200
 screen-length 30
```

- Console login configuration with the authentication mode being scheme

```
#
local-user guest
 password simple 123456
 service-type terminal
 level 2
#
user-interface aux 0
 authentication-mode scheme
 user privilege level 2
 history-command max-size 20
 idle-timeout 6 0
 speed 19200
 screen-length 30
```

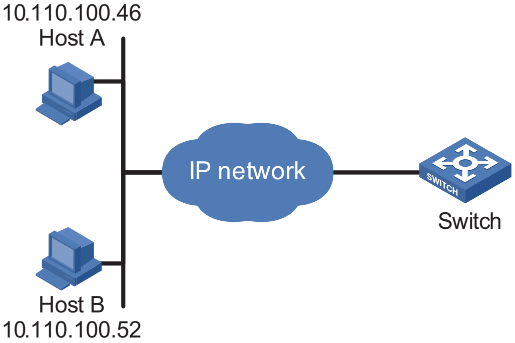
Precautions

None

Configuring Login Access Control

Network Diagram

Figure 3 Network diagram for login access control



Networking and Configuration Requirements

As shown in Figure 3, configure the switch to allow only Telnet/SNMP/WEB users at 10.110.100.52 and 10.110.100.46 to log in.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

Create basic ACL 2000 and enter basic ACL view.

```
[3Com] acl number 2000 match-order config
[3Com-acl-basic-2000]
```

# Define ACL rules to allow only Telnet/SNMP/WEB users at 10.110.100.52 and 10.110.100.46 to log into the switch.

```
[3Com-acl-basic-2000] rule 1 permit source 10.110.100.52 0
[3Com-acl-basic-2000] rule 2 permit source 10.110.100.46 0
[3Com-acl-basic-2000] rule 3 deny source any
[3Com-acl-basic-2000] quit
```

# Reference ACL 2000 to control Telnet login by source IP address.

```
[3Com] user-interface vty 0 4
[3Com-ui-vty0-4] acl 2000 inbound
```

# Reference ACL 2000 to control SNMP login by source IP address.

```
[3Com] snmp-agent community read aaa acl 2000
[3Com] snmp-agent group v2c groupa acl 2000
[3Com] snmp-agent usm-user v2c usera groupa acl 2000
```

# Reference ACL 2000 to control WEB login by source IP address.

```
[3Com] ip http acl 2000
```

Complete Configuration

- Configuration for Telnet login control by source IP address

```
#
acl number 2000
 rule 1 permit source 10.110.100.52 0
 rule 2 permit source 10.110.100.46 0
 rule 3 deny
#
user-interface vty 0 4
 acl 2000 inbound
```

- Configuration for SNMP login control by source IP address

```
#
acl number 2000
 rule 1 permit source 10.110.100.52 0
 rule 2 permit source 10.110.100.46 0
 rule 3 deny
#
 snmp-agent community read aaa acl 2000
 snmp-agent group v2c groupa acl 2000
 snmp-agent usm-user v2c usera groupa  acl 2000
```

- Configuration for WEB login control by source IP address

```
#
 ip http acl 2000
#
acl number 2000
 rule 1 permit source 10.110.100.52 0
 rule 2 permit source 10.110.100.46 0
 rule 3 deny
```

Precautions

None

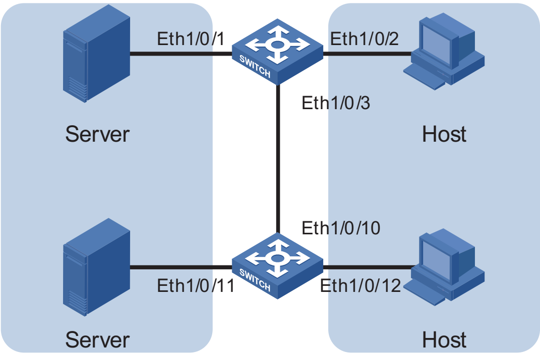
2 VLAN Configuration Guide

Configuring Port-Based VLAN

The VLAN technology allows you to divide a broadcast LAN into multiple distinct broadcast domains, each as a virtual workgroup. Port-based VLAN is the simplest approach to VLAN implementation. The idea is to assign the ports on a switch to different VLANs, confining the propagation of the packets received on a port within the particular VLAN. Thus, separation of broadcast domains and division of virtual groups are achieved.

Network Diagram

Figure 4 Network diagram for port-based VLAN configuration



Networking and Configuration Requirements

Switch A and Switch B are connected each to a server and workstation. To guarantee data security for the servers, you need to isolate the servers from the workstations by creating VLANs. Allow the devices within a VLAN to communicate with each other but not directly with the devices in another VLAN.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

Create VLAN 101 on Switch A and add Ethernet 1/0/1 to VLAN 101.

```
[SwitchA] vlan 101
[SwitchA-vlan101] port Ethernet 1/0/1
```

# Create VLAN 201 on Switch A and add Ethernet 1/0/2 to VLAN 201.

```
[SwitchA-vlan101] quit
[SwitchA] vlan 201
[SwitchA-vlan201] port Ethernet 1/0/2
```

# Configure Ethernet 1/0/3 of Switch A to be a trunk port and to permit the packets carrying the tag of VLAN 101 or VLAN 201 to pass through.

```
[SwitchA-vlan201] quit
[SwitchA] interface Ethernet 1/0/3
[SwitchA-Ethernet1/0/3] port link-type trunk
[SwitchA-Ethernet1/0/3] port trunk permit vlan 101 201
```

# Create VLAN 101 on Switch B, and add Ethernet 1/0/11 to VLAN 101.

```
[SwitchB] vlan 101
[SwitchB-vlan101] port Ethernet 1/0/11
```

# Create VLAN 201 on Switch B, and add Ethernet 1/0/12 to VLAN 201.

```
[SwitchB-vlan101] quit
[SwitchB] vlan 201
[SwitchB-vlan201] port Ethernet 1/0/12
```

# Configure Ethernet 1/0/10 of Switch B to be a trunk port and to permit the packets carrying the tag of VLAN 101 or VLAN 201 to pass through.

```
[SwitchB-vlan201] quit
[SwitchB] interface Ethernet 1/0/10
[SwitchB-Ethernet1/0/10] port link-type trunk
[SwitchB-Ethernet1/0/10] port trunk permit vlan 101 201
```

Complete Configuration

- Configuration on Switch A

```
#
vlan 101
#
vlan 201
#
interface Ethernet1/0/1
 port access vlan 101
#
interface Ethernet1/0/2
 port access vlan 201
#
interface Ethernet1/0/3
 port link-type trunk
 port trunk permit vlan 1 101 201
```

- Configuration on Switch B

```
#
vlan 101
#
vlan 201
#
interface Ethernet1/0/10
 port link-type trunk
 port trunk permit vlan 1 101 201
```

```
#
interface Ethernet1/0/11
 port access vlan 101
#
interface Ethernet1/0/12
 port access vlan 201
```

Precautions

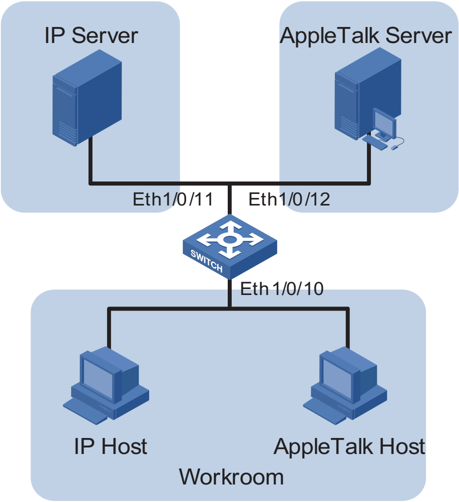
- After you assign the servers and the workstations to different VLANs, they cannot communicate with each other. For them to communicate, you need to configure a Layer 3 VLAN interface for each of them on the switches.
- After you telnet to an Ethernet port on a switch to make configuration, do not remove the port from its current VLAN. Otherwise, your Telnet connection will be disconnected.

Configuring Protocol-Based VLAN

Protocol-based VLAN, or protocol VLAN, is another approach to VLAN implementation other than port-based VLAN. With protocol VLAN, the switch compares each packet received without a VLAN tag against the protocol templates based on the encapsulation format and the specified field. If a match is found, the switch tags the packet with the corresponding VLAN ID. Thus, the switch can assign packets to a VLAN by protocol.

Network Diagram

Figure 5 Network diagram for protocol-based VLAN configuration



Networking and Configuration Requirements

Configure the switch to automatically assign IP packets and Appletalk packets of the workroom to different VLANs, ensuring that the workstations can communicate with their respective servers properly.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

Create VLAN 100 and VLAN 200; add Ethernet 1/0/11 to VLAN 100 and Ethernet 1/0/12 to VLAN 200.

1. Create VLAN 100 and add Ethernet1/0/11 to VLAN 100.

```
[3Com] vlan 100
[3Com-vlan100] port Ethernet 1/0/11
```

2. Create VLAN 200 and add Ethernet 1/0/12 to VLAN 200.

```
[3Com-vlan100] quit
[3Com] vlan 200
[3Com-vlan200] port Ethernet 1/0/12
```

# Configure protocol templates and bind them to ports.

3. Create a protocol template for VLAN 200 to carry Appletalk and a protocol template for VLAN 100 to carry IP.

```
[3Com-vlan200] protocol-vlan at
[3Com-vlan200] quit
[3Com] vlan 100
[3Com-vlan100] protocol-vlan ip
```

4. Create a user-defined protocol template for VLAN 100 to carry ARP for IP communication, assuming that Ethernet_II encapsulation is used.

```
[3Com-vlan100] protocol-vlan mode ethernetii etype 0806
```

5. Configure Ethernet 1/0/10 to be a hybrid port and to remove the outer VLAN tag when forwarding packets of VLAN 100 and VLAN 200.

```
[3Com-vlan100] quit
[3Com] interface Ethernet 1/0/10
[3Com-Ethernet1/0/10] port link-type hybrid
[3Com-Ethernet1/0/10] port hybrid vlan 100 200 untagged
```

6. Bind Ethernet 1/0/10 to protocol template 0 and protocol template 1 of VLAN 100, and protocol template 0 of VLAN 200.

When configuring a protocol template, you can assign a number to the template. If you fail to do that, the system automatically assigns the lowest available number to the template. Thus, in this configuration example, the two protocol templates for VLAN 100 are automatically numbered 0 and 1, and the protocol template for VLAN 200 is numbered 0.

```
[3Com-Ethernet1/0/10] port hybrid protocol-vlan vlan 100 0 to 1
[3Com-Ethernet1/0/10] port hybrid protocol-vlan vlan 200 0
```

Complete Configuration

```
#
vlan 100
 protocol-vlan 0 ip
 protocol-vlan 1 mode ethernetii etype 0806
#
vlan 200
 protocol-vlan 0 at
#
interface Ethernet1/0/10
 port link-type hybrid
 port hybrid vlan 1 100 200 untagged
 port hybrid protocol-vlan vlan 100 0
 port hybrid protocol-vlan vlan 100 1
 port hybrid protocol-vlan vlan 200 0
#
interface Ethernet1/0/11
 port access vlan 100
#
interface Ethernet1/0/12
 port access vlan 200
```

Precautions Because IP depends on ARP for address resolution in Ethernet, you are recommended to configure the IP and ARP templates in the same VLAN and associate them with the same port to prevent communication failure.

Up to five protocol templates can be bound to a port.

3 IP ADDRESS CONFIGURATION GUIDE

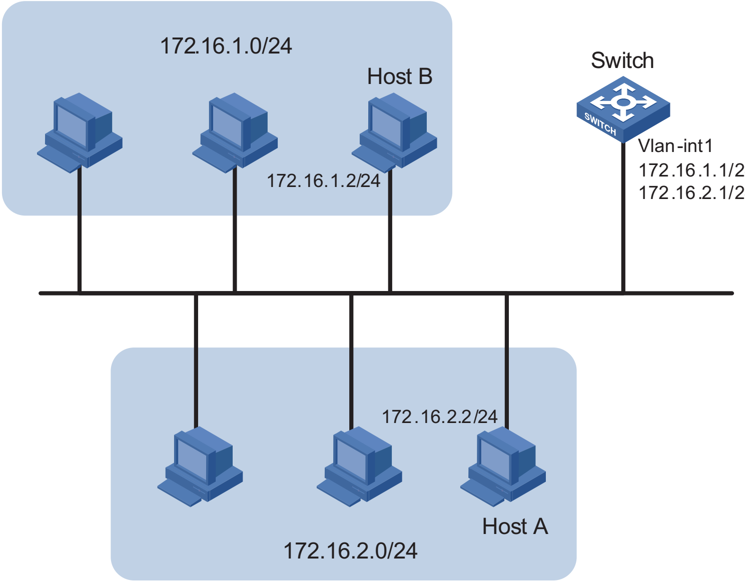
IP Address Configuration Guide

If you want to manage a remote Ethernet switch through network management or telnet, you need to configure an IP address for the remote switch and ensure that the local device and the remote switch are reachable to each other.

A 32-bit IP address identifies a host on the Internet. Generally, a VLAN interface on a switch is configured with one primary and four secondary IP addresses.

Network Diagram

Figure 6 Network diagram for IP address configuration



Networking and Configuration Requirements

As shown in the above figure, the port in VLAN 1 on Switch is connected to a LAN in which hosts belong to two network segments: 172.16.1.0/24 and 172.16.2.0/24. It is required to enable the hosts in the LAN to communicate with external networks through Switch, and to enable the hosts in the two network segments to communicate with each other.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

Assign a primary and secondary IP addresses to VLAN-interface 1 of Switch to ensure that all the hosts on the LAN can access external networks through Switch. Set Switch as the gateway on all the hosts of the two network segments to ensure that they can communicate with each other.

# Assign a primary IP address and a secondary IP address to VLAN-interface 1.

```
<Switch> system-view
[Switch] interface Vlan-interface 1
[Switch-Vlan-interface1] ip address 172.16.1.1 255.255.255.0
[Switch-Vlan-interface1] ip address 172.16.2.1 255.255.255.0 sub
```

# Set the gateway address to 172.16.1.1 on the hosts in subnet 172.16.1.0/24, and to 172.16.2.1 on the hosts in subnet 172.16.2.0/24.

# Ping Host B on Host A to verify the connectivity.

Complete Configuration

```
#
interface Vlan-interface 1
 ip address 172.16.1.1 255.255.255.0
 ip address 172.16.2.1 255.255.255.0 sub
#
```

Precautions

- You can assign at most five IP addresses to an interface, among which one is the primary IP address and the others are secondary IP addresses. A newly specified primary IP address overwrites the previous one.
- The primary and secondary IP addresses of an interface cannot reside on the same network segment; an IP address of a VLAN interface must not be on the same network segment as that of a loopback interface on a device.
- A VLAN interface cannot be configured with a secondary IP address if the interface has obtained an IP address through BOOTP or DHCP.

4 VOICE VLAN CONFIGURATION GUIDE

Configuring Voice VLAN

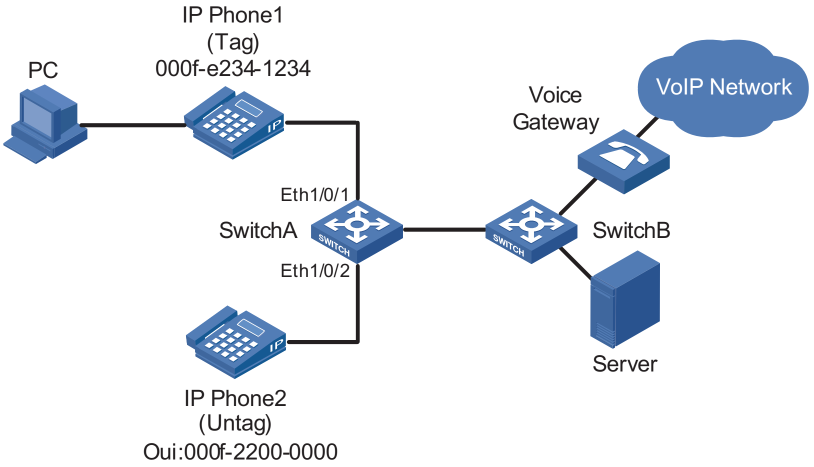
In automatic mode, the switch configured with voice VLAN checks the source MAC address of each incoming packet against the voice device vendor OUI. If a match is found, the switch assigns the receiving port to the voice VLAN and tags the packet with the voice VLAN ID automatically.

When the port joins the voice VLAN, a voice VLAN aging timer starts. If no voice packets have been received before the timer expires, the port leaves the voice VLAN.

In manual mode, you need to manually assign a port to or remove the port from the voice VLAN.

Network Diagram

Figure 7 Network diagram for voice VLAN in automatic mode



Networking and Configuration Requirements

As shown in Figure 7, PC is connected to Ethernet 1/0/1 of Switch A through IP phone 1, and IP phone 2 is connected to Ethernet 1/0/2 of Switch A. IP phone 1 sends out voice traffic with the tag of the voice VLAN, while IP phone 2 sends out voice traffic without any VLAN tag. Configure voice VLAN to satisfy the following requirements:

- VLAN 2 functions as the voice VLAN for transmitting voice traffic, and set the aging time of the voice VLAN to 100 minutes. VLAN 6 transmits user service data.
- Ethernet 1/0/1 and Ethernet 1/0/2 can recognize voice traffic automatically. Service data from PC and voice traffic are assigned to different VLANs and then transmitted to the server and the voice gateway respectively through Switch B.

- As the OUI address of IP phone 2 is not in the default voice device vendor OUI list of the switch, you need to add its OUI address 000f-2200-0000. In addition, configure its description as **IP Phone2**.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

Create VLAN 2 and VLAN 6.

```
<SwitchA> system-view
[SwitchA] vlan 2
[SwitchA-vlan2] quit
[SwitchA] vlan 6
[SwitchA-vlan6] quit
```

# Set the aging time for the voice VLAN.

```
[SwitchA] voice vlan aging 100
```

# Add 000f-2200-0000 to the OUI address list and configure its description as **IP Phone2**.

```
[SwitchA] voice vlan mac-address 000f-2200-0000 mask ffff-ff00-0000
description IP Phone2
```

# Configure VLAN 2 as the voice VLAN.

```
[SwitchA] voice vlan 2 enable
```

# Set the voice VLAN operation mode on Ethernet 1/0/1 to automatic. This step is optional, because the default operation mode of the voice VLAN is automatic.

```
[SwitchA] interface Ethernet 1/0/1
[SwitchA-Ethernet1/0/1] voice vlan mode auto
```

# Configure Ethernet 1/0/1 as a trunk port.

```
[SwitchA-Ethernet1/0/1] port link-type trunk
```

# Set VLAN 6 as the default VLAN of Ethernet 1/0/1 and configure Ethernet 1/0/1 to permit the packets of VLAN 6 to pass through. (PC data will be transmitted in the VLAN.)

```
[SwitchA-Ethernet1/0/1] port trunk pvid vlan 6
[SwitchA-Ethernet1/0/1] port trunk permit vlan 6
```

# Enable voice VLAN on Ethernet 1/0/1.

```
[SwitchA-Ethernet1/0/1] voice vlan enable
```

- *After the configuration above, PC data is automatically assigned to the default VLAN of Ethernet 1/0/1 (namely the service VLAN) for transmission. When IP* *phone traffic arrives at Ethernet 1/0/1, the port automatically permits the voice VLAN and transmits the voice traffic with the voice VLAN tag, so that the IP phone can receive packets normally.*

- *You can set Ethernet 1/0/1 as a hybrid or trunk port following the same procedure. In either case, you need to set the service VLAN as the default VLAN. As for voice traffic, when IP phone traffic arrives at the port, the port automatically permits the voice VLAN and transmits the traffic with the voice VLAN tag.*

# Set the voice VLAN operation mode of Ethernet 1/0/2 to manual. The operation mode must be manual because IP phone 2 can only send out untagged voice traffic.

```
[SwitchA-Ethernet1/0/1] quit
[SwitchA] interface Ethernet 1/0/2
[SwitchA-Ethernet1/0/2] undo voice vlan mode auto
```

# Configure Ethernet 1/0/2 to be an access port and permit the voice VLAN.

```
[SwitchA-Ethernet1/0/2] port access vlan 2
```

# Enable voice VLAN on Ethernet 1/0/2.

```
[SwitchA-Ethernet1/0/2] voice vlan enable
```

- *You can set Ethernet 1/0/2 as a trunk or hybrid port. In either case, configure the voice VLAN as the default VLAN and configure the port to remove the VLAN tag when forwarding traffic with the voice VLAN tag.*
- *If traffic from IP phone 2 is tagged, configure Ethernet 1/0/2 as a trunk or hybrid port where the default VLAN cannot be set to VLAN 20 and the packets of VLAN 20 must be sent with the VLAN tag.*

Complete Configuration

```
#
vlan 1 to 2
#
vlan 6
#
interface Ethernet1/0/1
 port link-type trunk
 port trunk permit vlan 1 6
 port trunk pvid vlan 6
 voice vlan enable
#
interface Ethernet1/0/2
 port access vlan 2
 undo voice vlan mode auto
 voice vlan enable
#
 voice vlan aging 100
 voice vlan mac-address 000f-2200-0000 mask ffff-ff00-0000 descripti
on IP Phone2
 voice vlan 2 enable
```

Precautions

- You cannot add a port operating in automatic mode to the voice VLAN manually. Therefore, if you configure a VLAN as a voice VLAN and a protocol VLAN at the same time, you will be unable to associate the protocol VLAN with such a port. Refer to *"Configuring Protocol-Based VLAN" on page 23* for description on protocol VLAN.
- You cannot set the voice VLAN as the default VLAN on a port in automatic mode.
- The switch supports only one voice VLAN.
- You cannot enable voice VLAN on a port configured with the Link Aggregation Control Protocol (LACP).
- Only a static VLAN can be configured as a voice VLAN.
- When the number of ACL rules applied to a port reaches the upper threshold, enabling voice VLAN on the port fails. You can use the **display voice vlan error-info** command to locate such ports.
- In the voice VLAN operating in security mode, the device allows only the packets whose source address matches a recognizable voice device vendor OUI to pass through. All other packets, including authentication packets such as 802.1x authentication packets, will be dropped. Therefore, you are recommended not to transmit both voice data and service data in the voice VLAN. If that is needed, disable the security mode of the voice VLAN.

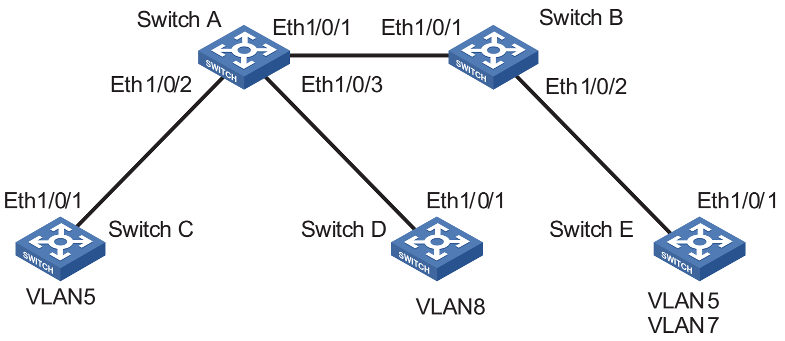
5 GVRP Configuration Guide

Configuring GVRP

GVRP enables a switch to propagate local VLAN registration information to other participant switches and dynamically update the VLAN registration information from other switches to its local database about active VLAN members and through which port they can be reached. GVRP ensures that all switches on a bridged LAN maintain the same VLAN registration information, while less manual configuration workload is involved.

Network Diagram

Figure 8 Network diagram for GVRP configuration



Networking and Configuration Requirements

As shown in Figure 8, all the switches in the network are Switch 5500s.

- All the involved Ethernet ports on the switches are configured to be trunk ports and permit all the VLANs to pass through.
- GVRP is enabled for all the switches globally and for all the ports on them.
- Configure static VLAN 5 for Switch C, static VLAN 8 for Switch D, and static VLAN 5 and static VLAN 7 for Switch E. Switch A and Switch B are not configured with static VLANs.
- Set the registration mode of Ethernet 1/0/1 on Switch E to fixed, and display dynamic VLAN registration information of Switch A, Switch B, and Switch E.
- Set the registration mode of Ethernet 1/0/1 on Switch E to forbidden, and display dynamic VLAN registration information of Switch A, Switch B, and Switch E.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

- Configure Switch A

# Enable GVRP globally.

```
<SwitchA> system-view
[SwitchA] gvrp
```

# Configure Ethernet 1/0/1 to be a trunk port and to permit the packets of all the VLANs to pass through.

```
[SwitchA] interface Ethernet 1/0/1
[SwitchA-Ethernet1/0/1] port link-type trunk
[SwitchA-Ethernet1/0/1] port trunk permit vlan all
```

# Enable GVRP on Ethernet 1/0/1.

```
[SwitchA-Ethernet1/0/1] gvrp
[SwitchA-Ethernet1/0/1] quit
```

# Configure Ethernet 1/0/2 to be a trunk port and to permit the packets of all the VLANs to pass through.

```
[SwitchA] interface Ethernet 1/0/2
[SwitchA-Ethernet1/0/2] port link-type trunk
[SwitchA-Ethernet1/0/2] port trunk permit vlan all
```

# Enable GVRP on Ethernet 1/0/2.

```
[SwitchA-Ethernet1/0/2] gvrp
[SwitchA-Ethernet1/0/2] quit
```

# Configure Ethernet 1/0/3 to be a trunk port and to permit the packets of all the VLANs to pass through.

```
[SwitchA] interface Ethernet 1/0/3
[SwitchA-Ethernet1/0/3] port link-type trunk
[SwitchA-Ethernet1/0/3] port trunk permit vlan all
```

# Enable GVRP on Ethernet 1/0/3.

```
[SwitchA-Ethernet1/0/3] gvrp
[SwitchA-Ethernet1/0/3] quit
```

- Configure Switch B

# Configure Ethernet 1/0/1 and Ethernet 1/0/2 to be trunk ports and to permit the packets of all the VLANs to pass through. Enable GVRP globally and enable GVRP on the two ports. # The configuration on Switch B is similar to that on Switch A.

- Configure Switch C

# Create VLAN 5.

```
<SwitchC> system-view
[SwitchC] vlan5
[SwitchC-vlan5]
```

# Configure Ethernet 1/0/1 to be a trunk port and to permit the packets of all the VLANs to pass through. Enable GVRP globally and enable GVRP on the port. # The configuration on Switch C is similar to that on Switch A.

For simplicity, the following provides only configuration steps. For configuration commands, refer to "Configure Switch C" on page 34.

- Configure Switch D

# Configure Ethernet 1/0/1 to be a trunk port and to permit the packets of all the VLANs to pass through. Enable GVRP globally and enable GVRP on the port.

# Create VLAN 8.

- Configure Switch E

# Configure Ethernet 1/0/1 to be a trunk port and to permit the packets of all the VLANs to pass through. Enable GVRP globally and enable GVRP on the port.

# Create VLAN 5 and VLAN 7.

- Display the static VLAN registration information on Switch A, Switch B, and Switch C.

# Display the dynamic VLAN information on Switch A.

```
[SwitchA] display vlan dynamic
 Total 3 dynamic VLAN exist(s).
 The following dynamic VLANs exist:
  5, 7, 8,
```

# Display the dynamic VLAN information on Switch B.

```
[SwitchB] display vlan dynamic
 Total 3 dynamic VLAN exist(s).
 The following dynamic VLANs exist:
  5, 7, 8,
```

# Display the dynamic VLAN information on Switch E.

```
[SwitchE] display vlan dynamic
 Total 1 dynamic VLAN exist(s).
 The following dynamic VLANs exist:
  8
```

- Set the registration mode of Ethernet 1/0/1 on Switch E to fixed, and display the dynamic VLAN registration information on Switch A, Switch B, and Switch E.

# Set the registration mode of Ethernet 1/0/1 on Switch E to fixed.

```
[SwitchE] interface Ethernet 1/0/1
[SwitchE-Ethernet1/0/1] gvrp registration fixed
```

# Display the dynamic VLAN information on Switch A.

```
[SwitchA] display vlan dynamic
 Total 3 dynamic VLAN exist(s).
 The following dynamic VLANs exist:
  5, 7, 8,
```

# Display the dynamic VLAN information on Switch B.

```
[SwitchB] display vlan dynamic
 Total 3 dynamic VLAN exist(s).
 The following dynamic VLANs exist:
  5, 7, 8,
```

# Display the dynamic VLAN information on Switch E.

```
[SwitchE-Ethernet1/0/1] display vlan dynamic
  No dynamic vlans exist!
```

- Set the registration mode of Ethernet 1/0/1 on Switch E to forbidden, and display the dynamic VLAN registration information on Switch A, Switch B, and Switch E.

# Set the registration mode of Ethernet 1/0/1 on Switch E to forbidden.

```
[SwitchE-Ethernet1/0/1] gvrp registration forbidden
```

# Display the dynamic VLAN information on Switch A.

```
[SwitchA] display vlan dynamic
 Total 2 dynamic VLAN exist(s).
 The following dynamic VLANs exist:
  5, 8,
```

# Display the dynamic VLAN information on Switch B.

```
[SwitchB] display vlan dynamic
 Total 2 dynamic VLAN exist(s).
 The following dynamic VLANs exist:
  5, 8,
```

# Display the dynamic VLAN information on Switch E.

```
[SwitchE] display vlan dynamic
  No dynamic vlans exist!
```

Complete Configuration

- Configuration on Switch A

```
#
 gvrp
#
interface Ethernet1/0/1
 port link-type trunk
 port trunk permit vlan all
 gvrp
#
interface Ethernet1/0/2
 port link-type trunk
 port trunk permit vlan all
 gvrp
```

```
#
interface Ethernet1/0/3
 port link-type trunk
 port trunk permit vlan all
 gvrp
```

- Configuration on Switch B

```
#
 gvrp
#
interface Ethernet1/0/1
 port link-type trunk
 port trunk permit vlan all
 gvrp
#
interface Ethernet1/0/2
 port link-type trunk
 port trunk permit vlan all
 gvrp
```

- Configuration on Switch C

```
#
 gvrp
#
vlan 5
#
interface Ethernet1/0/1
 port link-type trunk
 port trunk permit vlan all
 gvrp
```

- Configuration on Switch D

```
#
 gvrp
#
vlan 8
#
interface Ethernet1/0/1
 port link-type trunk
 port trunk permit vlan all
 gvrp
```

- Configuration on Switch E

```
#
 gvrp
#
vlan 5
#
vlan 7
#
interface Ethernet1/0/1
 port link-type trunk
 port trunk permit vlan all
 gvrp registration forbidden
 gvrp
```

Precautions

- The **port trunk permit vlan all** command is designed for GVRP only. To prevent users of unauthorized VLANs from accessing restrictive resources from a port, do not use the command when GVRP is disabled on the port.
- Before enabling GVRP on a port, enable GVRP globally first.
- Use GVRP only on trunk ports. You cannot change the link type of a trunk port with GVRP enabled.

6 PORT BASIC CONFIGURATION GUIDE

Configuring the Basic Functions of an Ethernet Port

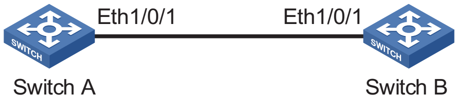
An Ethernet port on a Switch 5500 can operate in one of the three link types:

- Access: an access port can belong to only one VLAN and is generally used to connect to a PC.
- Trunk: a trunk port can belong to multiple VLANs. It can receive/send packets of multiple VLANs and is generally used to connect to a switch.
- Hybrid: a hybrid port can belong to multiple VLANs. It can receive/send packets of multiple VLANs and can be used to connect to either a switch or a PC.

You can add an Ethernet port to a specified VLAN. After that, the Ethernet port can forward the packets of the specified VLAN, so that the VLAN on this switch can intercommunicate with the same VLAN on the peer switch.

Network Diagram

Figure 9 Network diagram for Ethernet port configuration



Networking and Configuration Requirements

- Switch A and Switch B are connected through the trunk port Ethernet 1/0/1 on each side.
- Specify VLAN 100 as the default VLAN of Ethernet 1/0/1.
- Configure Ethernet 1/0/1 to permit the packets of VLAN 2, VLAN 6 through VLAN 50, and VLAN 100 to pass through.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

- *The following provides only the configuration on Switch A. The configuration on Switch B is similar to that on Switch A.*
- *This configuration example assumes that VLAN 2, VLAN 6 through VLAN 50, and VLAN 100 have been created.*

# Enter Ethernet port view of Ethernet 1/0/1.

```
<3Com> system-view
System View: return to User View with Ctrl+Z.
[3Com] interface ethernet1/0/1
```

# Configure Ethernet 1/0/1 as a trunk port.

```
[3Com-Ethernet1/0/1] port link-type trunk
```

# Configure Ethernet 1/0/1 to permit the packets of VLAN 2, VLAN 6 through VLAN 50, and VLAN 100 to pass through.

```
[3Com-Ethernet1/0/1] port trunk permit vlan 2 6 to 50 100
```

# Configure VLAN 100 as the default VLAN of Ethernet 1/0/1.

```
[3Com-Ethernet1/0/1] port trunk pvid vlan 100
```

Complete Configuration

```
#
interface Ethernet1/0/1
 port link-type trunk
 port trunk permit vlan 1 to 2 6 to 50 100
 port trunk pvid vlan 100
#
```

Refer to "VLAN Configuration Guide" on page 21 for the use of hybrid ports.

Precautions

Do not configure the **port trunk permit vlan all** command on a trunk port with GVRP disabled. To configure the trunk port to permit the packets of multiple VLANs to pass through, use the **port trunk permit vlan** *vlan-id-list* command instead.

7 LINK AGGREGATION CONFIGURATION GUIDE

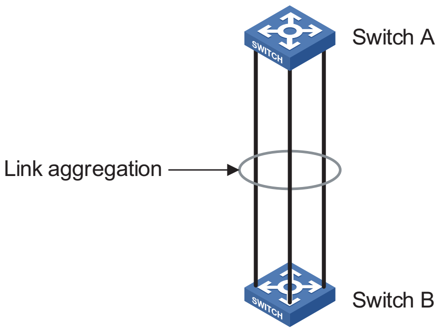
Configuring Link Aggregation

Link aggregation aggregates multiple ports into one logical link, also called an aggregation group.

Link aggregation allows you to increase bandwidth by distributing incoming/outgoing traffic on the member ports in the aggregation group. In addition, it provides reliable connectivity because these member ports can dynamically back up each other.

Network Diagram

Figure 10 Network diagram for link aggregation configuration



Networking and Configuration Requirements

Aggregate Ethernet 1/0/1 through 1/0/3 on Switch A into an aggregation group and connect the group to Switch B to balance incoming/outgoing traffic among the member ports.

The example will show you how to configure link aggregation in different aggregation modes.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

The example only provides the configuration on Switch A. Perform the same configuration on Switch B to implement link aggregation.

1 In manual aggregation mode

# Create manual aggregation group 1.

```
<3Com> system-view
[3Com] link-aggregation group 1 mode manual
```

# Add Ethernet 1/0/1 through Ethernet 1/0/3 to aggregation group 1.

```
[3Com] interface Ethernet1/0/1
[3Com-Ethernet1/0/1] port link-aggregation group 1
[3Com-Ethernet1/0/1] quit
[3Com] interface Ethernet1/0/2
[3Com-Ethernet1/0/2] port link-aggregation group 1
[3Com-Ethernet1/0/2] quit
[3Com] interface Ethernet1/0/3
[3Com-Ethernet1/0/3] port link-aggregation group 1
```

2 In static LACP aggregation mode

# Create static aggregation group 1.

```
<3Com> system-view
[3Com] link-aggregation group 1 mode static
```

# Add Ethernet 1/0/1 through Ethernet 1/0/3 to aggregation group 1.

```
[3Com] interface Ethernet1/0/1
[3Com-Ethernet1/0/1] port link-aggregation group 1
[3Com-Ethernet1/0/1] quit
[3Com] interface Ethernet1/0/2
[3Com-Ethernet1/0/2] port link-aggregation group 1
[3Com-Ethernet1/0/2] quit
[3Com] interface Ethernet1/0/3
[3Com-Ethernet1/0/3] port link-aggregation group 1
```

3 In dynamic LACP aggregation mode

# Enable LACP on Ethernet 1/0/1 through Ethernet 1/0/3.

```
<3Com> system-view
[3Com] interface Ethernet1/0/1
[3Com-Ethernet1/0/1] lacp enable
[3Com-Ethernet1/0/1] quit
[3Com] interface Ethernet1/0/2
[3Com-Ethernet1/0/2] lacp enable
[3Com-Ethernet1/0/2] quit
[3Com] interface Ethernet1/0/3
[3Com-Ethernet1/0/3] lacp enable
```

Complete Configuration

1. In manual aggregation mode

```
#
 link-aggregation group 1 mode manual
#
interface Ethernet1/0/1
 port link-aggregation group 1
#
interface Ethernet1/0/2
 port link-aggregation group 1
#
interface Ethernet1/0/3
 port link-aggregation group 1
#
```

2. In static LACP aggregation mode

```
#
 link-aggregation group 1 mode static
#
interface Ethernet1/0/1
 port link-aggregation group 1
#
interface Ethernet1/0/2
 port link-aggregation group 1
#
interface Ethernet1/0/3
 port link-aggregation group 1
#
```

3. In dynamic LACP aggregation mode

```
#
interface Ethernet1/0/1
 lacp enable
#
interface Ethernet1/0/2
 lacp enable
#
interface Ethernet1/0/3
 lacp enable
#
```

Precautions

- If static LACP aggregation or manual aggregation is adopted, you are recommended not to cross-connect the aggregation member ports at the two ends to avoid packet loss. For example, if local port 1 is connected to remote port 2, do not connect local port 2 to remote port 1.
- Dynamic LACP aggregation mode is not recommended in actual networking scenarios.
- The implementation of static aggregation varies by platform software version. This may result in problems when products using different platform software versions are interconnected through static aggregation groups. Use the **display version** command to view the platform software version.
- The Switch 4210 supports only the manual aggregation mode.

8 Port Isolation Configuration Guide

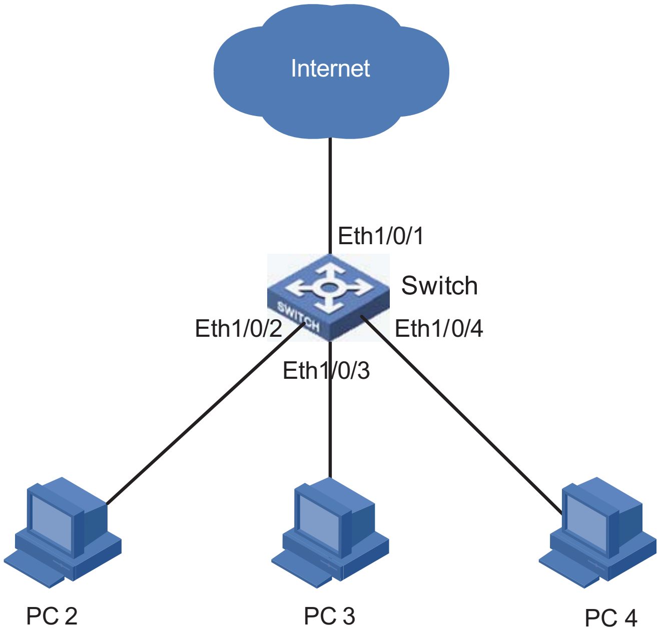
Configuring Port Isolation

Port isolation allows you to add a port into an isolation group to isolate Layer-2 and Layer-3 traffic of the port from that of all other ports in the isolation group. While increasing network security, this allows for great flexibility.

Currently, the Switch 5500 supports only one isolation group; however, the number of Ethernet ports in the isolation group is not limited.

Network Diagram

Figure 11 Network diagram for port isolation configuration



Networking and Configuration Requirements

- PC2, PC3, and PC4 connect to the switch ports Ethernet 1/0/2, Ethernet 1/0/3, and Ethernet 1/0/4 respectively.
- The switch connects to the Internet through Ethernet 1/0/1.
- Isolate PC2, PC3, and PC4 from each other.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

Add Ethernet 1/0/2, Ethernet 1/0/3, and Ethernet 1/0/4 to the isolation group.

```
<3Com> system-view
System View: return to User View with Ctrl+Z.
[3Com] interface ethernet1/0/2
[3Com-Ethernet1/0/2] port isolate
[3Com-Ethernet1/0/2] quit
[3Com] interface ethernet1/0/3
[3Com-Ethernet1/0/3] port isolate
[3Com-Ethernet1/0/3] quit
[3Com] interface ethernet1/0/4
[3Com-Ethernet1/0/4] port isolate
[3Com-Ethernet1/0/4] quit
[3Com]
```

# Display information about the ports in the isolation group.

```
<3Com> display isolate port
 Isolated port(s) on UNIT 1:
 Ethernet1/0/2, Ethernet1/0/3, Ethernet1/0/4
```

Complete Configuration

```
#
interface Ethernet1/0/2
 port isolate
#
interface Ethernet1/0/3
 port isolate
#
interface Ethernet1/0/4
 port isolate
#
```

Precautions

- Adding to or removing from an isolation group an aggregated port can cause all other ports in the aggregation group on the device to join or exit the isolation group automatically.
- After an aggregated port is removed from its aggregation group, all other member ports will still stay in the isolation group that they have joined (if any).
- Removing an aggregation group does not remove its member ports from the isolation group that they have joined (if any).
- Adding an isolated port to an aggregation group can cause all the member ports in the aggregation group to join the isolation group automatically.
- Cross-device port isolation is supported on the Switch 5500 in an XRN fabric. This allows ports on different units to join the same isolation group.
- For the Switch 5500 in an XRN fabric, adding a member port in a cross-device aggregation group to an isolation group does not cause other member ports to join the isolation group automatically. For them to join the isolation group, you need to perform the configuration manually for each of them.

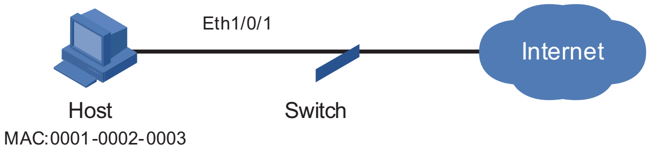
9 PORT SECURITY CONFIGURATION GUIDE

Configuring Port Security autolearn Mode

In **autolearn** mode, a port can learn a specified number of MAC addresses and save those addresses as secure MAC addresses. Once the number of secure MAC addresses learnt by the port exceeds the upper limit defined by the **port-security max-mac-count** command, the port transits to the secure mode. In secure mode, a port does not save any new secure MAC addresses and permits only packets whose source addresses are secure MAC address or configured dynamic MAC addresses.

Network Diagram

Figure 12 Network diagram for configuring port security autolearn mode



Networking and Configuration Requirements

On port Ethernet 1/0/1 of the switch, perform configurations to meet the following requirements:

- Allow a maximum of 80 users to access the port without authentication, and save the automatically learned user MAC addresses as secure MAC addresses.
- To ensure that the host can access the network, add the MAC address 0001-0002-0003 as a secure MAC address to VLAN 1 on the port.
- Once the number of secure MAC addresses reaches 80, the port stops MAC address learning. If any frame with an unknown source MAC address arrives, intrusion protection is triggered and the port is disabled and kept silent for 30 seconds.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

Enter system view.

```
<3Com> system-view
```

# Enable port security.

```
[3Com] port-security enable
```

# Enter Ethernet 1/0/1 port view.

```
[3Com] interface Ethernet1/0/1
```

# Set the maximum number of MAC addresses allowed on the port to 80.

```
[3Com-Ethernet1/0/1] port-security max-mac-count 80
```

# Set the port security mode to **autolearn**.

```
[3Com-Ethernet1/0/1] port-security port-mode autolearn
```

# Add the MAC address 0001-0002-0003 as a secure MAC address to VLAN 1.

```
[3Com-Ethernet1/0/1] mac-address security 0001-0002-0003 vlan 1
```

# Configure the port to be silent for 30 seconds after intrusion protection is triggered.

```
[3Com-Ethernet1/0/1] port-security intrusion-mode disableport-temporarily
[3Com-Ethernet1/0/1] quit
[3Com] port-security timer disableport 30
```

Complete Configuration

```
#
 port-security enable
 port-security timer disableport 30
#
interface Ethernet1/0/1
 port-security max-mac-count 80
 port-security port-mode autolearn
 port-security intrusion-mode disableport-temporarily
 mac-address security 0001-0002-0003 vlan 1
#
```

Precautions

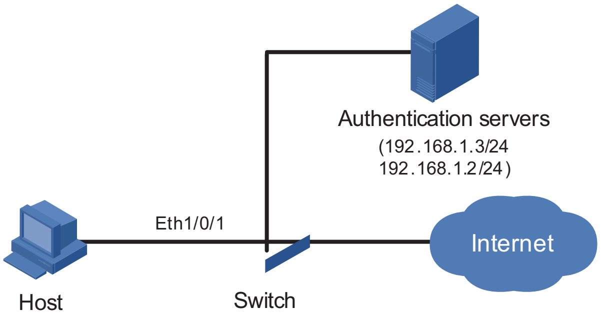
- Before enabling port security, be sure to disable 802.1x and MAC authentication globally.
- On a port configured with port security, you cannot configure the maximum number of MAC addresses that the port can learn, reflector port for port mirroring, fabric port or link aggregation.

Configuring Port Security mac-authentication Mode

In **mac-authentication** mode, a port performs MAC authentication of users.

Network Diagram

Figure 13 Network diagram for configuring port security mac-authentication mode



Networking and Configuration Requirements

The host connects to the switch through the port Ethernet 1/0/1, and the switch authenticates the host through the RADIUS server. If the authentication is successful, the host is authorized to access the Internet.

On port Ethernet 1/0/1 of the switch, perform configurations to meet the following requirements:

- The switch performs MAC authentication of users.
- All users belong to the domain **aabbcc.net**, and each of them uses the MAC address as username and password for authentication.
- Whenever a packet fails MAC authentication, intrusion protection is triggered to filter packets whose source MAC addresses are the same as that of the packet failing the authentication, ensuring the security of the port.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

- *The following configurations involve some AAA/RADIUS configuration commands. For details about the commands, refer to "AAA Configuration" in the Configuration Guide for your product.*
- *Configurations on the user host and the RADIUS server are omitted.*
- Configure RADIUS parameters

# Create a RADIUS scheme named **radius1**.

```
<3Com> system-view
[3Com] radius scheme radius1
```

# Specify the primary RADIUS authentication server and primary RADIUS accounting server.

```
[3Com-radius-radius1] primary authentication 192.168.1.3
[3Com-radius-radius1] primary accounting 192.168.1.2
```

# Specify the secondary RADIUS authentication server and secondary RADIUS accounting server.

```
[3Com-radius-radius1] secondary authentication 192.168.1.2
[3Com-radius-radius1] secondary accounting 192.168.1.3
```

# Set the shared key for message exchange between the switch and the RADIUS authentication servers to **name**.

```
[3Com-radius-radius1] key authentication name
```

# Set the shared key for message exchange between the switch and the accounting RADIUS servers to **money**.

```
[3Com-radius-radius1] key accounting money
```

# Configure the switch to send a username without the domain name to the RADIUS server.

```
[3Com-radius-radius1] user-name-format without-domain
[3Com-radius-radius1] quit
```

# Create a domain named **aabbcc.net** and enter its view.

```
[3Com] domain aabbcc.net
```

# Specify the RADIUS scheme for the domain.

```
[3Com-isp-aabbcc.net] scheme radius-scheme radius1
[3Com-isp-aabbcc.net] quit
```

# Set **aabbcc.net** as the default user domain.

```
[3Com] domain default enable aabbcc.net
```

# Configure the switch to use MAC addresses as usernames for authentication, specifying that the MAC addresses should be lowercase without separators.

```
[3Com] mac-authentication authmode usernameasmacaddress usernameform
at without-hyphen
```

# Specify the ISP domain for MAC authentication.

```
[3Com] mac-authentication domain aabbcc.net
```

# Enable port security.

```
[3Com] port-security enable
```

# Set the port security mode to **mac-authentication**.

```
[3Com] interface Ethernet 1/0/1
[3Com-Ethernet1/0/1] port-security port-mode mac-authentication
```

# Configure the port to drop packets whose source addresses are the same as that of the packet failing MAC authentication after intrusion protection is triggered.

```
[3Com-Ethernet1/0/1] port-security intrusion-mode blockmac
```

Complete Configuration

```
#
 domain default enable aabbcc.net
#
 port-security enable
#
 MAC-authentication domain aabbcc.net
#
radius scheme radius1
 server-type standard
 primary authentication 192.168.1.3
 primary accounting 192.168.1.2
 secondary authentication 192.168.1.2
 secondary accounting 192.168.1.3
 key authentication name
 key accounting money
 user-name-format without-domain
#
domain aabbcc.net
 scheme radius-scheme radius1
#
interface Ethernet1/0/1
 port-security port-mode mac-authentication
 port-security intrusion-mode blockmac
```

Precautions

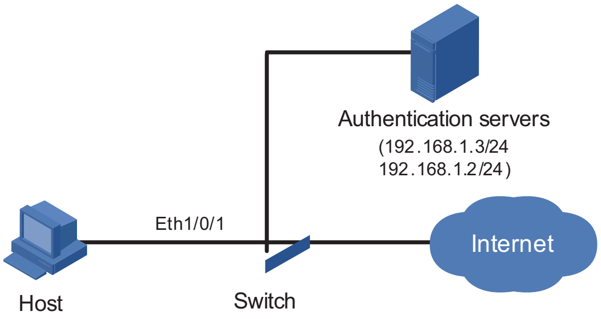
- Before enabling port security, be sure to disable 802.1x and MAC authentication globally.
- On a port configured with port security, you cannot configure the maximum number of MAC addresses that the port can learn, reflector port for port mirroring, fabric port, or link aggregation.

Configuring Port Security userlogin-withoui Mode

In the **userlogin-withoui** mode, a port authenticates users using MAC-based 802.1x and permits only packets from authenticated users. Besides, the port also allows packets whose source MAC addresses have a specified organizationally unique identifier (OUI) value to pass the port.

Network Diagram

Figure 14 Network diagram for configuring port security userlogin-withoui mode



Networking and Configuration Requirements

The host connects to the switch through the port Ethernet 1/0/1, and the switch authenticates the host through the RADIUS server. If the authentication is successful, the host is authorized to access the Internet.

On port Ethernet 1/0/1 of the switch, perform configurations to meet the following requirements:

- Allow one 802.1x user to get online.
- Set two OUI values, and allow only one user whose MAC address matches one of the two OUI values to get online.
- Configure port security trapping to monitor the operations of the 802.1x-authenticated user.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

- *The following configurations involve some AAA/RADIUS configuration commands. For details about the commands, refer to "AAA Configuration" in the Configuration Guide for your product.*
- *Configurations on the user host and the RADIUS server are omitted.*
- Configure RADIUS parameters

# Create a RADIUS scheme named **radius1**.

```
<3Com> system-view
[3Com] radius scheme radius1
```

# Specify the primary RADIUS authentication server and primary RADIUS accounting server.

```
[3Com-radius-radius1] primary authentication 192.168.1.3
[3Com-radius-radius1] primary accounting 192.168.1.2
```

# Specify the secondary RADIUS authentication server and secondary RADIUS accounting server.

```
[3Com-radius-radius1] secondary authentication 192.168.1.2
[3Com-radius-radius1] secondary accounting 192.168.1.3
```

# Set the shared key for message exchange between the switch and the RADIUS authentication servers to **name**.

```
[3Com-radius-radius1] key authentication name
```

# Set the shared key for message exchange between the switch and the accounting RADIUS servers to **money**.

```
[3Com-radius-radius1] key accounting money
```

# Set the interval and the number of packet transmission attempts for the switch to send packets to the RADIUS server.

```
[3Com-radius-radius1] timer 5
[3Com-radius-radius1] retry 5
```

# Set the timer for the switch to send real-time accounting packets to the RADIUS server to 15 minutes.

```
[3Com-radius-radius1] timer realtime-accounting 15
```

# Configure the switch to send a username without the domain name to the RADIUS server.

```
[3Com-radius-radius1] user-name-format without-domain
[3Com-radius-radius1] quit
```

# Create a domain named **aabbcc.net** and enter its view.

```
[3Com] domain aabbcc.net
```

# Specify **radius1** as the RADIUS scheme of the user domain, and the local authentication scheme as the backup scheme when the RADIUS server is not available.

```
[3Com-isp-aabbcc.net] scheme radius-scheme radius1 local
```

# Set the maximum number of users of the ISP domain to 30.

```
[3Com-isp-aabbcc.net] access-limit enable 30
```

# Enable the idle disconnecting function and set the related parameters.

```
[3Com-isp-aabbcc.net] idle-cut enable 20 2000
[3Com-isp-aabbcc.net] quit
```

# Set **aabbcc.net** as the default user domain.

```
[3Com] domain default enable aabbcc.net
```

# Create a local user.

```
[3Com] local-user localuser
[3Com-luser-localuser] service-type lan-access
[3Com-luser-localuser] password simple localpass
```

- Configure port security

# Enable port security.

```
[3Com] port-security enable
```

# Add two OUI values.

```
[3Com] port-security oui 1234-0100-1111 index 1
[3Com] port-security oui 1234-0200-1111 index 2
```

# Set the port security mode to **userlogin-withoui**.

```
[3Com] interface Ethernet 1/0/1
[3Com-Ethernet1/0/1] port-security port-mode userlogin-withoui
[3Com-Ethernet1/0/1] quit
```

# Configure port security trapping.

```
[3Com] port-security trap dot1xlogfailure
[3Com] port-security trap dot1xlogon
[3Com] port-security trap dot1xlogoff
```

Complete Configuration

```
#
 domain default enable aabbcc.net
#
 port-security enable
 port-security trap dot1xlogon
 port-security trap dot1xlogoff
 port-security trap dot1xlogfailure
 port-security oui 1234-0100-0000 index 1
 port-security oui 1234-0200-0000 index 2
#
radius scheme radius1
 server-type standard
 primary authentication 192.168.1.3
 primary accounting 192.168.1.2
 secondary authentication 192.168.1.2
 secondary accounting 192.168.1.3
 key authentication name
 key accounting money
 timer realtime-accounting 15
 timer response-timeout 5
 retry 5
 user-name-format without-domain
#
domain aabbcc.net
 scheme radius-scheme radius1 local
 access-limit enable 30
 idle-cut enable 20 2000
#
local-user localuser
 password simple localpass
 service-type lan-access
#
interface Ethernet1/0/1
 port-security port-mode userlogin-withoui
#
```

Precautions

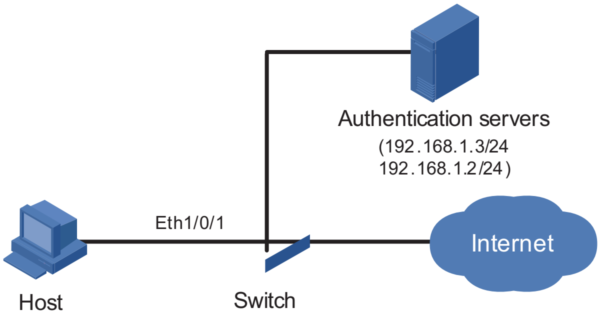
- Before enabling port security, be sure to disable 802.1x and MAC authentication globally.
- On a port configured with port security, you cannot configure the maximum number of MAC addresses that the port can learn, reflector port for port mirroring, fabric port, or link aggregation.

Configuring Port Security mac-else-userlogin-secure-ext Mode

In **mac-else-userlogin-secure-ext** mode, a port first performs MAC authentication of a user. If the authentication is successful, the user can access the port; otherwise, the port performs 802.1x authentication of the user. In this mode, there can be more than one authenticated user on a port.

Network Diagram

Figure 15 Network diagram for configuring port security mac-else-userlogin-secure-ext mode



Networking and Configuration Requirements

The host connects to the switch through the port Ethernet 1/0/1, and the switch authenticates the host through the RADIUS server. After successful authentication, the host is authorized to access the Internet.

On port Ethernet 1/0/1 of the switch, perform configurations to meet the following requirements:

- Perform MAC authentication of users and then 802.1x authentication if MAC authentication fails.
- Allow up to 64 802.1x authenticated users to get online. The total number of 802.1x authenticated users and MAC address authenticated users cannot exceed 200.
- All users belong to the domain **aabbcc.net**, and each user uses the MAC address of the host as the username and password for authentication.
- Enable NeedToKnow feature to prevent packets from being sent to unknown destination MAC addresses.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

- *The following configurations involve some AAA/RADIUS configuration commands. For details about the commands, refer to “AAA Configuration” in the Configuration Guide for your product.*
- *Configurations on the user host and the RADIUS server are omitted.*
- Configure RADIUS parameters

# Create a RADIUS scheme named **radius1**.

```
<3Com> system-view
[3Com] radius scheme radius1
```

# Specify the primary RADIUS authentication server and primary RADIUS accounting server.

```
[3Com-radius-radius1] primary authentication 192.168.1.3
[3Com-radius-radius1] primary accounting 192.168.1.2
```

# Specify the secondary RADIUS authentication server and secondary RADIUS accounting server.

```
[3Com-radius-radius1] secondary authentication 192.168.1.2
[3Com-radius-radius1] secondary accounting 192.168.1.3
```

# Set the shared key for message exchange between the switch and the RADIUS authentication servers to **name**.

```
[3Com-radius-radius1] key authentication name
```

# Set the shared key for message exchange between the switch and the accounting RADIUS servers to **money**.

```
[3Com-radius-radius1] key accounting money
```

# Set the interval and the number of packet transmission attempts for the switch to send packets to the RADIUS server.

```
[3Com-radius-radius1] timer 5
[3Com-radius-radius1] retry 5
```

# Set the timer for the switch to send real-time accounting packets to the RADIUS server to 15 minutes.

```
[3Com-radius-radius1] timer realtime-accounting 15
```

# Configure the switch to send a username without the domain name to the RADIUS server.

```
[3Com-radius-radius1] user-name-format without-domain
[3Com-radius-radius1] quit
```

# Create a domain named **aabbcc.net** and enter its view.

```
[3Com] domain aabbcc.net
```

# Specify the RADIUS scheme for the domain.

```
[3Com-isp-aabbcc.net] scheme radius-scheme radius1
```

# Enable the idle disconnecting function and set the related parameters.

```
[3Com-isp-aabbcc.net] idle-cut enable 20 2000
[3Com-isp-aabbcc.net] quit
```

# Set **aabbcc.net** as the default user domain.

```
[3Com] domain default enable aabbcc.net
```

# Set the maximum number of concurrent 802.1x users.

```
[3Com] dot1x max-user 64
```

# Configure the switch to use MAC addresses as usernames for authentication, specifying that the MAC addresses should be lowercase without separators.

```
[3Com] mac-authentication authmode usernameasmacaddress usernameform
at without-hyphen
```

# Specify the ISP domain for MAC authentication.

```
[3Com] mac-authentication domain aabbcc.net
```

# Enable port security.

```
[3Com] port-security enable
```

# Set the maximum number of secure MAC addresses allowed on the port to 200.

```
[3Com] interface Ethernet 1/0/1
[3Com-Ethernet1/0/1] port-security max-mac-count 200
```

# Set the port security mode to **mac-else-userlogin-secure-ext**.

```
[3Com-Ethernet1/0/1] port-security port-mode mac-else-userlogin-secure-ext
```

# Set the NeedToKnow mode of the port to **ntkonly**.

```
[3Com-Ethernet1/0/1] port-security ntk-mode ntkonly
```

Complete Configuration

```
#
 domain default enable aabbcc.net
#
 port-security enable
#
 MAC-authentication domain aabbcc.net
#
radius scheme radius1
 server-type standard
 primary authentication 192.168.1.3
 primary accounting 192.168.1.2
 secondary authentication 192.168.1.2
 secondary accounting 192.168.1.3
 key authentication name
 key accounting money
 timer realtime-accounting 15
 timer response-timeout 5
 retry 5
 user-name-format without-domain
#
domain aabbcc.net
 scheme radius-scheme radius1
 idle-cut enable 20 2000
#
interface Ethernet1/0/1
 port-security max-mac-count 200
 port-security port-mode mac-else-userlogin-secure-ext
 port-security ntk-mode ntkonly
 dot1x max-user 64
```

Precautions

- Before enabling port security, be sure to disable 802.1x and MAC authentication globally.
- On a port configured with port security, you cannot configure the maximum number of MAC addresses that the port can learn, reflector port for port mirroring, fabric port, or link aggregation.

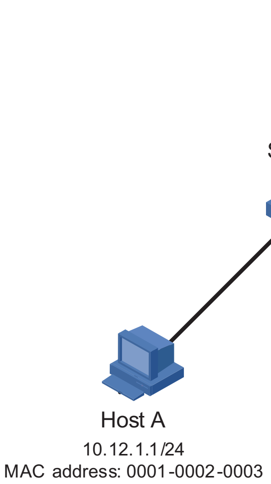
10 PORT BINDING CONFIGURATION GUIDE

Configuring a Port Binding

Port binding allows the network administrator to bind the MAC and IP addresses of a user to a specific port. After the port binding operation, the switch forwards a packet received from the port only if the source MAC address and IP address carried in the packet have been bound to the port. This improves network security and enhances security monitoring.

Network Diagram

Figure 16 Network diagram for port binding configuration



Networking and Configuration Requirements

To prevent the IP address of Host A from being used by a malicious user, bind the MAC address and IP addresses of Host A to Ethernet 1/0/1 on Switch A.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

Enter system view.

```
<3Com> system-view
```

# Enter Ethernet 1/0/1 port view on switch A.

```
[3Com] interface Ethernet1/0/1
```

Bind the MAC address and the IP address of Host A to Ethernet 1/0/1.

```
[3Com-Ethernet1/0/1] am user-bind mac-addr 0001-0002-0003 ip-addr 10.12.1.1
```

Complete Configuration

```
<3Com> system-view
[3Com] interface Ethernet1/0/1
[3Com-Ethernet1/0/1] am user-bind mac-addr 0001-0002-0003 ip-addr 10.12.1.1
```

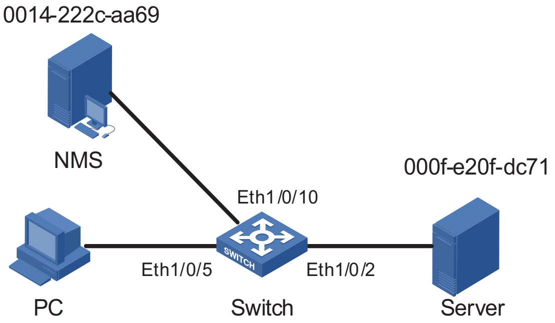
11 MAC Address Table Management Configuration Guide

MAC Address Table Management

The Switch 5500 provides the MAC address table management function. Through configuration commands, you can add/modify/remove a MAC address, set the aging time for dynamic MAC addresses, and set the maximum number of MAC addresses an Ethernet port can learn.

Network Diagram

Figure 17 Network diagram for MAC address table management configuration



Networking and Configuration Requirements

Server is connected to Switch through port Ethernet 1/0/2. Configure a static MAC address containing the Server MAC address on Switch, so that Switch can unicast rather than broadcast packets destined for Server through Ethernet 1/0/2. Port Ethernet 1/0/10 is connected with a network management server (NMS). For network management security, configure Ethernet 1/0/10 to permit the access of this NMS only.

- The Server MAC address is 000f-e20f-dc71.
- Port Ethernet 1/0/2 belongs to VLAN 10.
- The NMS MAC address is 0014-222c-aa69.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

Add ports Ethernet 1/0/5 and Ethernet 1/0/2 to VLAN 10.

```
<3Com> system-view
[3Com] vlan 10
[3Com-vlan]
```

# Add a static MAC address entry.

```
[3Com] mac-address static 000f-e20f-dc71 interface Ethernet 1/0/2 vlan 1
```

# Set the aging time of dynamic MAC address entries on Switch to 500 seconds.

```
[3Com] mac-address timer aging 500
```

# Display the MAC address table configuration in system view.

```
[3Com] display mac-address interface Ethernet 1/0/2
MAC ADDR            VLAN ID STATE   PORT INDEX      AGING TIME(s)
000f-e20f-dc71  1       Static  Ethernet1/0/2   NOAGED
00e0-fc17-a7d6  1       Learned Ethernet1/0/2   AGING
00e0-fc5e-b1fb  1       Learned Ethernet1/0/2   AGING
00e0-fc55-f116  1       Learned Ethernet1/0/2   AGING
---  4 mac address(es) found on port Ethernet1/0/2 ---
```

# Disable Ethernet 1/0/10 from learning MAC addresses dynamically, and add a static MAC address entry. So that port Ethernet 1/0/10 can only send packets destined for the NMS, and other hosts cannot communicate through this port.

```
[3Com] interface Ethernet 1/0/10
[3Com-Ethernet1/0/10] port access vlan 10
[3Com-Ethernet1/0/10] mac-address max-mac-count 0
[3Com-Ethernet1/0/10] mac-address static 0014-222c-aa69 vlan 10
```

Complete Configuration

```
#
interface Ethernet1/0/2
 port access vlan 10
 mac-address static 000f-e20f-dc71 vlan 1
#
interface Ethernet1/0/10
 mac-address max-mac-count 0
 port access vlan 10
 mac-address static 0014-222c-aa69 vlan 10
#
 mac-address timer aging 500
```

Precautions

- When you add a MAC address entry, the port specified by the **interface** keyword must belong to the VLAN specified by the **vlan** keyword in the command. Otherwise, the entry will not be added.
- If the VLAN specified by the **vlan** keyword is a dynamic VLAN, adding a static MAC address entry will make the VLAN become a static VLAN.

12

DLDP CONFIGURATION GUIDE

Configuring DLDP

Sometimes, unidirectional links may appear in networks. On a unidirectional link, one end can receive packets from the other end but the other end cannot.

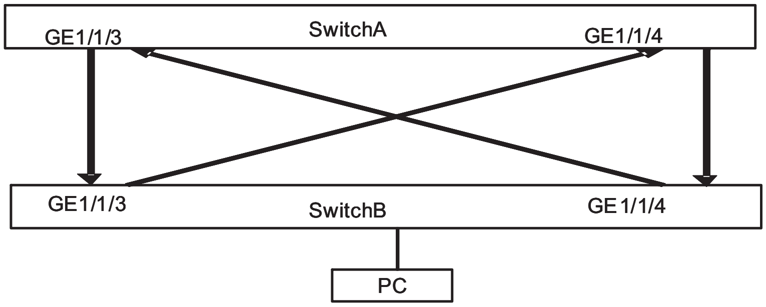
Unidirectional links can be caused by fiber cross-connection or fiber cut (including single-fiber cut and lack of a fiber connection).

They can cause problems such as spanning tree topology loops.

You can use the Device Link Detection Protocol (DLDP) to monitor the link status of optical fiber cables and copper twisted pairs such as super category 5 twisted pairs. Once detecting a unidirectional link, DLDP shuts down the port or ask you to do so depending on your configuration.

Network Diagram

Figure 18 Network diagram for DLDP configuration



Networking and Configuration Requirements

- Switch A and Switch B are connected through two pairs of fibers. The connecting ports are operating in mandatory full duplex mode at 1000 Mbps. Both of the switches support DLDP.
- Configure DLDP to automatically disconnect the detected unidirectional link.
- After the fibers are connected correctly, the port shut down by DLDP restores automatically.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

- Configure Switch A

# Configure the ports to work in mandatory full duplex mode at 1000 Mbps.

```
<SwitchA> system-view
[SwitchA] interface GigabitEthernet 1/1/3
[SwitchA-GigabitEthernet1/1/3] duplex full
[SwitchA-GigabitEthernet1/1/3] speed 1000
[SwitchA-GigabitEthernet1/1/3] quit
[SwitchA] interface GigabitEthernet 1/1/4
[SwitchA-GigabitEthernet1/1/4] duplex full
[SwitchA-GigabitEthernet1/1/4] speed 1000
[SwitchA-GigabitEthernet1/1/4] quit
```

# Enable DLDP globally.

```
[SwitchA] dldp enable
```

# Set the interval for sending DLDP packets to 15 seconds.

```
[SwitchA] dldp interval 15
```

# Configure DLDP to operate in enhanced mode.

```
[SwitchA] dldp work-mode enhance
```

# Configure DLDP to shut down a port automatically once a unidirectional link is detected on it.

```
[SwitchA] dldp unidirectional-shutdown auto
```

# Display the DLDP state.

```
[SwitchA] display dldp 1
```

# Restore the ports brought down by DLDP.

```
[SwitchA] dldp reset
```

- Configure Switch B

The configuration on Switch B is the same as that on Switch A.

Complete Configuration

- Configuration on Switch A

```
#
dldp interval 15
dldp work-mode enhance
#
interface Gigabitethernet 1/1/3
 duplex full
 speed 1000
 dldp enable
#
interface Gigabitethernet 1/1/4
 duplex full
 speed 1000
 dldp enable
```

- Configuration on Switch B

The configuration on Switch B is the same as that on Switch A.

Precautions

1 When enabling DLDP on two connected devices, make sure that they are using the same software version. Otherwise, DLDP may malfunction.

2 When optical fibers are cross-connected, two or three ports are in the disable state, and the remaining ports are in the inactive state.

3 DLDP in the enhanced mode can identify unidirectional links caused by fiber cross-connection or fiber cut.

4 DLDP in the normal mode can identify only unidirectional links caused by fiber cross-connection.

5 You are recommended to set the Delaydown timer to 5 seconds on the DLDP-enabled devices that are connected with each other.

13 AUTO DETECT CONFIGURATION GUIDE

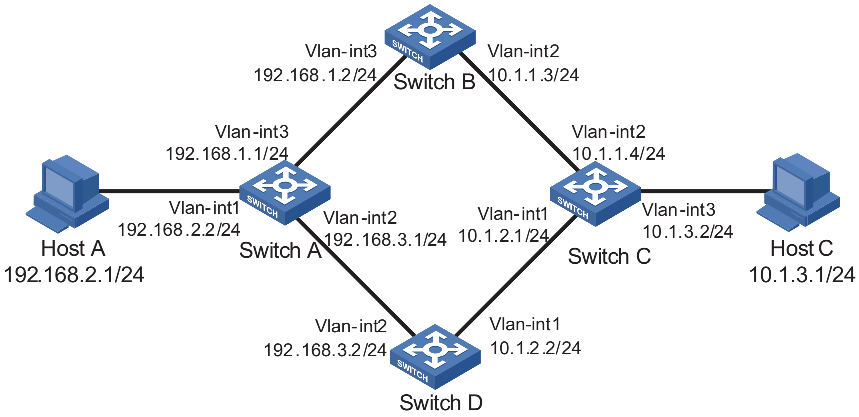
Auto Detect Implementation in Static Routing

You can bind a static route with a detected group. The auto detect function will then detect the reachability of the static route through the path specified in the detected group.

- The static route is valid if the detected group is **reachable**.
- The static route is invalid if the detected group is **unreachable**.

Network Diagram

Figure 19 Network diagram of applying auto detect to static routing



Networking and Configuration Requirements

- Make sure there is a route between Switch A and Switch B, Switch B and Switch C, Switch A and Switch D, and Switch D and Switch C.
- On Switch A, configure two static routes to Host C with different preferences. The one with higher preference (smaller value) is used as the master route, and the other as the backup route.
- Normally, Switch A adopts the master route to send data to Host C through Switch B.
- Create detected group 8 on Switch A; detect the reachability of IP address 10.1.1.4/24, with the next hop being 192.168.1.2, and the detecting number being 1.
- If the detected group 8 is **reachable**, the master route is valid, and Switch A adopts the master route to send data to Host C through Switch B.
- If the detected group is **unreachable**, the master route is invalid, and Switch A adopts the backup route to send data to Host C through Switch D.
- Similarly, configure two static routes to Host A on Switch C. Normally, Switch C sends data to Host A through Switch B.

- Create detected group 9 on Switch C; detect the reachability of IP address 10.1.1.3, with the next hop being 192.168.1.1/24, and the detecting number being 1.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

Configure IP addresses for the interfaces according to Figure 19. The configuration procedure is omitted here.

- Configure Switch A

# Enter system view.

```
<SwitchA> system-view
```

# Create detected group 8.

```
[SwitchA] detect-group 8
```

# Detect the reachability of 10.1.1.4, with the next hop being 192.168.1.2, and the detecting number being 1.

```
[SwitchA-detect-group-8] detect-list 1 ip address 10.1.1.4 nexthop 1
92.168.1.2
[SwitchA-detect-group-8] quit
```

# Configure a static route to Switch C.

```
[SwitchA] ip route-static 10.1.1.4 24 192.168.1.2
```

# Configure the master static route, which is valid when the detected group is **reachable**.

```
[SwitchA] ip route-static 10.1.3.1 24 192.168.1.2 detect-group 8
```

# Configure the backup static route, and set its preference to 80. The backup route is valid when the detected group is **unreachable**.

```
[SwitchA] ip route-static 10.1.3.1 24 192.168.3.2 preference 80
```

- Configure Switch C

# Enter system view.

```
<SwitchC> system-view
```

# Create detected group 9.

```
[SwitchC] detect-group 9
```

# Detect the reachability of 10.1.1.3, with the next hop being 192.168.1.1/24, and the detecting number being 1.

```
[SwitchC-detect-group-9] detect-list 1 ip address 192.168.1.1 nextho
p 10.1.1.3
[SwitchC-detect-group-9] quit
```

# Configure a static route to Switch A.

```
[SwitchC] ip route-static 192.168.1.1 24 10.1.1.3
```

# Configure the master route, which is valid when the detected group is **reachable**.

```
[SwitchC] ip route-static 192.168.2.1 24 10.1.1.3 detect-group 9
```

# Configure the backup static route, and set its preference to 80. The backup route is valid when the detected group is **unreachable**.

```
[SwitchC] ip route-static 192.168.2.1 24 10.1.2.2 preference 80
```

This configuration procedure only provides the auto-detect related configuration. To ensure the normal communication between Host A and Host C, corresponding static routes must already exist on Switch B and Switch D.

Complete Configuration

- Configure Switch A

```
#
detect-group 8
 detect-list 1 ip address 10.1.1.4 nexthop 192.168.1.2
#
 ip route-static 10.1.1.0 255.255.255.0 192.168.1.2 preference 60
 ip route-static 10.1.3.0 255.255.255.0 192.168.1.2 preference 60 de
tect-group 8
 ip route-static 10.1.3.0 255.255.255.0 192.168.3.2 preference 80
#
```

- Configure Switch C

```
#
detect-group 9
 detect-list 1 ip address 192.168.1.1 nexthop 10.1.1.3
#
 ip route-static 192.168.1.0 255.255.255.0 10.1.1.3 preference 60
 ip route-static 192.168.2.0 255.255.255.0 10.1.1.3 preference 60 de
tect-group 9
 ip route-static 192.168.2.0 255.255.255.0 10.1.2.2 preference 80
#
```

Precautions

None

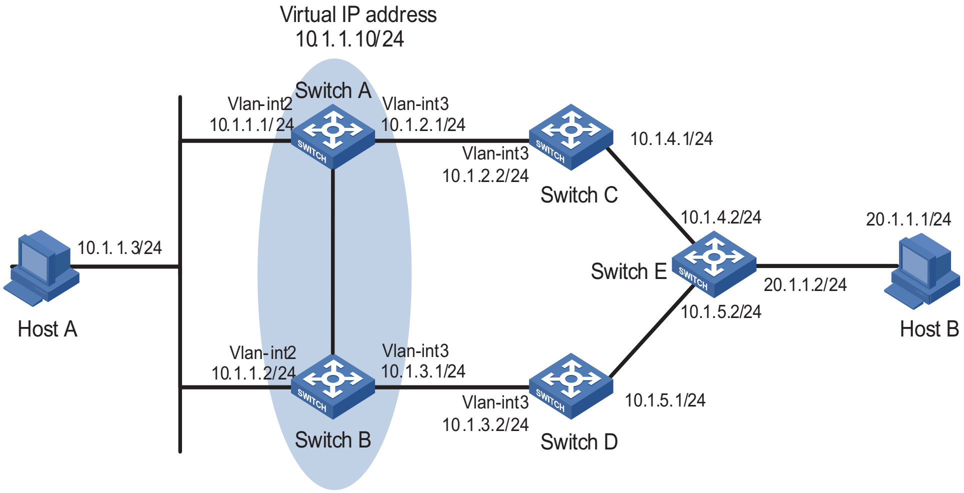
Auto Detect Implementation in VRRP

You can use the auto detect function on the master switch of a VRRP group to detect the routes from the master switch to other networks, and use the detection results (reachable/unreachable) to control the priority of the master switch, so as to realize the automatic master-backup switchover:

- The master switch remains as master when the detected group is **reachable**.
- The priority of the master switch decreases and thus becomes a backup when the detected group is **unreachable**.

Network Diagram

Figure 20 Network diagram of applying auto detect to VRRP



Networking and Configuration Requirements

- Make sure there is a route between Switch A and Switch C, Switch C and Switch E, Switch B and Switch D, and Switch D and Switch E.
- Create VRRP group 1 containing Switch A and Switch B, and set the virtual IP address of the group to 10.1.1.10/24.
- Normally, data of Host A is forwarded to Host B through Switch A.
- If the link between Switch C and Switch E fails, Switch B becomes the master of VRRP group 1. Data of Host A is forwarded to Host B through Switch B.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

Configure IP addresses for the interfaces according to Figure 20. The configuration procedure is omitted here.

- Configure Switch A

# Create detected group 9.

```
<SwitchA> system-view
[SwitchA] detect-group 9
```

# Detect the reachability of 10.1.4.2, with the next hop being 10.1.2.2, and the detecting number being 1.

```
[SwitchA-detect-group-9] detect-list 1 ip address 10.1.4.2 nexthop 10.1.2.2
[SwitchA-detect-group-9] quit
```

# Configure an IP address for VLAN-interface 2.

```
[SwitchA] interface vlan-interface 2
[SwitchA-Vlan-interface2] ip address 10.1.1.1 24
```

# Enable VRRP on VLAN-interface 2, and set the virtual IP address of the VRRP group to 10.1.1.10.

```
[SwitchA-Vlan-interface2] vrrp vrid 1 virtual-ip 10.1.1.10
```

# Set the VRRP priority of Switch A to 110, and specify to decrease the priority by 20 when the result of detected group 9 is **unreachable**.

```
[SwitchA-Vlan-interface2] vrrp vrid 1 priority 110
[SwitchA-Vlan-interface2] vrrp vrid 1 track detect-group 9 reduced 20
```

- Configure Switch B

# Configure an IP address for VLAN-interface 2.

```
<SwitchB> system-view
[SwitchB] interface vlan-interface 2
[SwitchB-Vlan-interface2] ip address 10.1.1.2 24
```

# Enable VRRP on VLAN-interface 2, and set the virtual IP address of the VRRP group to 10.1.1.10.

```
[SwitchB-Vlan-interface2] vrrp vrid 1 virtual-ip 10.1.1.10
```

# Set the VRRP priority of Switch B to 100.

```
[SwitchB-Vlan-interface2] vrrp vrid 1 priority 100
```

This configuration procedure only provides the auto-detect and VRRP related configuration. To use auto detect function properly, a route to Switch A must already exist on Switch E.

Complete Configuration

- Configure Switch A

```
#
detect-group 9
 detect-list 1 ip address 10.1.4.2 nexthop 10.1.2.2
#
interface Vlan-interface2
 ip address 10.1.1.1 255.255.255.0
 vrrp vrid 1 virtual-ip 10.1.1.10
 vrrp vrid 1 priority 110
 vrrp vrid 1 track detect-group 9 reduced 20
```

- Configure Switch B

```
#
interface Vlan-interface2
 ip address 10.1.1.2 255.255.255.0
 vrrp vrid 1 virtual-ip 10.1.1.10
#
```

Precautions

None

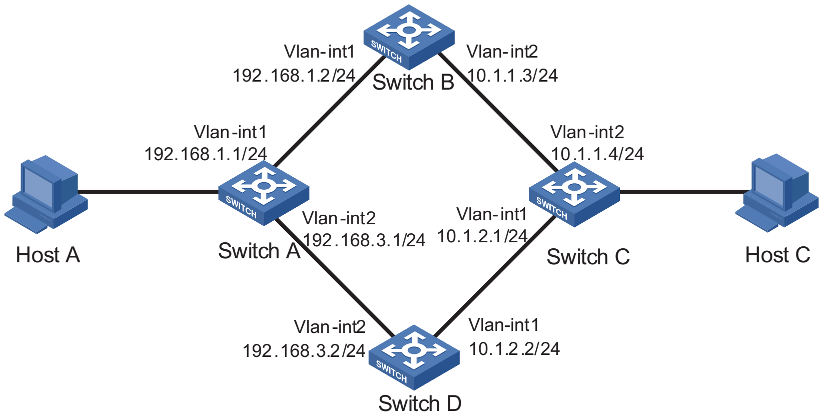
Auto Detect Implementation in VLAN Interface Backup

You can implement VLAN interface backup through auto detect. When data can be transmitted through two VLAN interfaces on the switch to the same destination, configure one of the VLAN interfaces as the active interface and the other as the standby interface. Through the auto detect function, the standby interface is enabled automatically when the active fails, so as to ensure the data transmission:

- In normal situations (that is, when the detected group is **reachable**), the standby VLAN interface is down and packets are sent to the destination through the active VLAN interface.
- When the communication between the active VLAN interface and the destination fails (that is, the detected group is **unreachable**), the system enables the backup VLAN interface.
- When the communication between the active VLAN interface and the destination resumes, the system shuts down the standby VLAN interface again.

Network Diagram

Figure 21 Network diagram of applying auto detect to VLAN interface backup



Networking and Configuration Requirements

- Make sure that there is a route between Switch A and Switch B, Switch B and Switch C, Switch A and Switch D, and Switch D and Switch C.
- Create detected group 10 on Switch A to detect the connectivity between Switch A and Switch C.
- Configure VLAN-interface 1 to be the active interface, which is enabled when the detected group 10 is **reachable**.
- Configure VLAN-interface 2 to be the standby interface, which is enabled when the detected group 10 is **unreachable**.
- Create detected group 9 on Switch C to detect the connectivity between Switch C and Switch A.
- Configure VLAN-interface 2 to be the active interface, which is enabled when the detected group 9 is **reachable**.
- Configure VLAN-interface 1 to be the standby interface, which is enabled when the detected group 9 is **unreachable**.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

- Configure Switch A

# Enter system view.

```
<SwitchA> system-view
```

# Configure an IP address for VLAN-interface 1.

```
[SwitchA] interface vlan-interface 1
[SwitchA-Vlan-interface1] ip address 192.168.1.1 24
[SwitchA-Vlan-interface1] quit
```

# Configure an IP address for VLAN-interface 2.

```
[SwitchA] interface vlan-interface 2
[SwitchA-Vlan-interface2] ip address 192.168.3.1 24
[SwitchA-Vlan-interface2] quit
```

# Create detected group 10.

```
[SwitchA] detect-group 10
```

# Detect the reachability of 10.1.1.4, with the next hop being 192.168.1.2, and the detecting number being 1.

```
[SwitchA-detect-group-10] detect-list 1 ip address 10.1.1.4 nexthop
192.168.1.2
[SwitchA-detect-group-10] quit
```

# Configure VLAN-interface 2 as the standby interface, which is enabled when the detected group 10 is **unreachable**.

```
[SwitchA] interface vlan-interface 2
[SwitchA-Vlan-interface2] standby detect-group 10
```

- Configure Switch C

# Enter system view.

```
<SwitchC> system-view
```

# Configure an IP address for VLAN-interface 2.

```
[SwitchC] interface vlan-interface 2
[SwitchC-Vlan-interface2] ip address 10.1.1.4 24
[SwitchC-Vlan-interface2] quit
```

# Configure an IP address for VLAN-interface 1.

```
[SwitchC] interface vlan-interface 1
[SwitchC-Vlan-interface1] ip address 10.1.2.1 24
[SwitchC-Vlan-interface1] quit
```

# Create detected group 9.

```
[SwitchC] detect-group 9
```

# Detect the reachability of 192.168.1.1/24, with the next hop being 10.1.1.3, and the detecting number being 1.

```
[SwitchC-detect-group-9] detect-list 1 ip address 192.168.1.1 nextho
p 10.1.1.3
[SwitchC-detect-group-9] quit
```

# Configure VLAN-interface 1 as the standby interface, which is enabled when the detected group 9 is **unreachable**.

```
[SwitchC] interface vlan-interface 1
[SwitchC-Vlan-interface1] standby detect-group 9
```

This configuration procedure only provides the auto-detect related configuration. To use auto detect function properly, a Switch A-to-Switch B-to-Switch C route must already exist on Switch A, and a Switch C-to-Switch B-to-Switch A route must already exist on Switch C.

Complete Configuration

- Configure Switch A

```
#
detect-group 10
 detect-list 1 ip address 10.1.1.4 nexthop 192.168.1.2
#
vlan 1
#
vlan 2
#
interface Vlan-interface1
 ip address 192.168.1.1 255.255.255.0
#
interface Vlan-interface2
 standby detect-group 10
 ip address 192.168.3.1 255.255.255.0
```

- Configure Switch C

```
#
detect-group 9
 detect-list 1 ip address 192.168.1.1 nexthop 10.1.1.3
#
vlan 1
#
vlan 2
#
interface Vlan-interface1
 standby detect-group 9
 ip address 10.1.2.1 255.255.255.0
#
interface Vlan-interface2
```

```
 ip address 10.1.1.4 255.255.255.0
#
```

Precautions

None

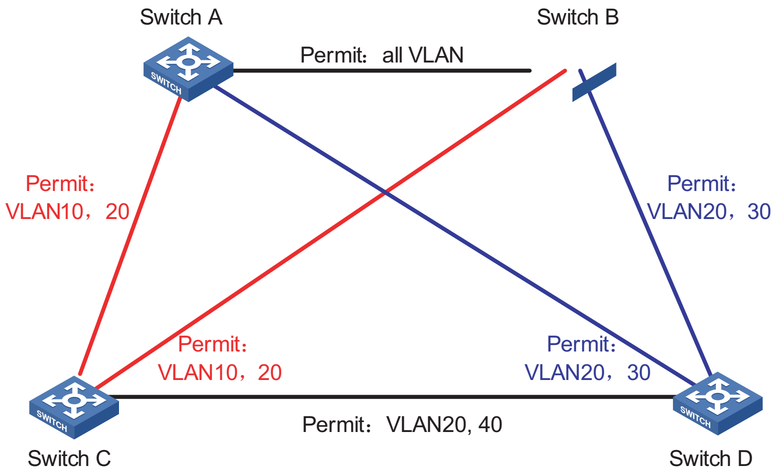
14 MSTP Configuration Guide

Configuring MSTP

The Switch 5500 supports the Multiple Spanning Tree Protocol (MSTP), which allows you to map one or multiple VLANs to a multiple spanning tree instance (MSTI). Note that one VLAN can be mapped to only one MSTI. With MSTP, the packets of a specific VLAN are transmitted in the MSTI to which the VLAN is mapped, thus saving overhead and reducing resource utilization.

Network Diagram

Figure 22 Network diagram for MSTP configuration



VLAN	MSTI
VLAN 10	MSTI 1
VLAN 20	MSTI 0
VLAN 30	MSTI 3
VLAN 40	MSTI 4

Networking and Configuration Requirements

Configure MSTP in the network shown in Figure 22 to enable packets of different VLANs to travel along different MSTIs. Do the following:

- Assign all switches in the network to the same MST region.
- Enable packets of VLAN 10, VLAN 30, VLAN 40, and VLAN 20 to travel along MSTI 1, MSTI 3, MSTI 4, and MSTI 0 respectively.

In this network, Switch A and Switch B are operating at the distribution layer; Switch C and Switch D are operating at the access layer. VLAN 10 and VLAN 30 are terminated at the distribution layer and VLAN 40 is terminated at the access layer. Configure Switch A as the root bridge of MSTI 1, Switch B as the root bridge of MSTI 3, and Switch C as the root bridge of MSTI 4.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

1 Configuration on Switch A

# Enter MST region view.

```
<3Com> system-view
[3Com] stp region-configuration
```

# Configure the region name, VLAN-to-MSTI mapping, and revision level of the MST region.

```
[3Com-mst-region] region-name example
[3Com-mst-region] instance 1 vlan 10
[3Com-mst-region] instance 3 vlan 30
[3Com-mst-region] instance 4 vlan 40
[3Com-mst-region] revision-level 0
```

# Activate the MST region configuration manually.

```
[3Com-mst-region] active region-configuration
```

# Specify Switch A as the root bridge of MSTI 1.

```
[3Com] stp instance 1 root primary
```

2 Configuration on Switch B

# Enter MST region view.

```
<3Com> system-view
[3Com] stp region-configuration
```

# Configure the region name, VLAN-to-MSTI mapping, and revision level of the MST region.

```
[3Com-mst-region] region-name example
[3Com-mst-region] instance 1 vlan 10
[3Com-mst-region] instance 3 vlan 30
[3Com-mst-region] instance 4 vlan 40
[3Com-mst-region] revision-level 0
```

# Activate the MST region configuration manually.

```
[3Com-mst-region] active region-configuration
```

# Specify Switch B as the root bridge of MSTI 3.

```
[3Com] stp instance 3 root primary
```

3 Configuration on Switch C

# Configure the MST region.

```
<3Com> system-view
[3Com] stp region-configuration
[3Com-mst-region] region-name example
[3Com-mst-region] instance 1 vlan 10
[3Com-mst-region] instance 3 vlan 30
[3Com-mst-region] instance 4 vlan 40
[3Com-mst-region] revision-level 0
```

# Activate the MST region configuration manually.

```
[3Com-mst-region] active region-configuration
```

# Specify Switch C as the root bridge of MSTI 4.

```
[3Com] stp instance 4 root primary
```

4 Configuration on Switch D

# Enter MST region view.

```
<3Com> system-view
[3Com] stp region-configuration
```

# Configure the MST region.

```
[3Com-mst-region] region-name example
[3Com-mst-region] instance 1 vlan 10
[3Com-mst-region] instance 3 vlan 30
[3Com-mst-region] instance 4 vlan 40
[3Com-mst-region] revision-level 0
```

# Activate the MST region configuration manually.

```
[3Com-mst-region] active region-configuration
```

Complete Configuration

- Configuration on Switch A

```
#
 stp instance 1 root primary
stp region-configuration
 region-name example
 instance 1 vlan 10
 instance 3 vlan 30
 instance 4 vlan 40
 active region-configuration
#
```

- Configuration on Switch B

```
#
 stp instance 3 root primary
stp region-configuration
 region-name example
 instance 1 vlan 10
 instance 3 vlan 30
 instance 4 vlan 40
 active region-configuration
#
```

- Configuration on Switch C

```
#
 stp instance 4 root primary
stp region-configuration
 region-name example
 instance 1 vlan 10
 instance 3 vlan 30
 instance 4 vlan 40
 active region-configuration
#
```

- Configuration on Switch D

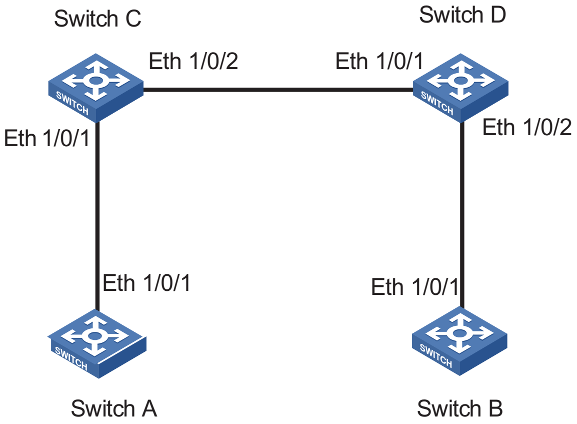
```
#
stp region-configuration
 instance 1 vlan 10
 instance 3 vlan 30
 instance 4 vlan 40
 active region-configuration
#
```

Configuring VLAN-VPN Tunneling

VLAN-VPN tunneling enables BPDUs to be transparently transmitted between geographically dispersed customer networks through a specific VLAN VPN over the service provider network. This allows the customer networks to share a spanning tree independent of that of the service provider network.

Network Diagram

Figure 23 Network diagram for VLAN-VPN tunneling configuration



Networking and Configuration Requirements

- Use the Switch 5500 (Switch C and Switch D in the network diagram) as access devices of the service provider network.
- Use the Switch 4210 (Switch A and Switch B in the network diagram) as access devices of the customer networks.
- Connect Switch C and Switch D through trunk ports. Enable VLAN-VPN tunneling in system view to achieve transparent transmission between the customer networks over the service provider network.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

1 Configuration on Switch A

# Enable MSTP.

```
<3Com> system-view
[3Com] stp enable
```

# Add Ethernet 1/0/1 to VLAN 10.

```
[3Com] vlan 10
[3Com-Vlan10] port Ethernet1/0/1
```

2 Configuration on Switch B

# Enable MSTP.

```
<3Com> system-view
[3Com] stp enable
```

# Add Ethernet 1/0/1 to VLAN 10.

```
[3Com] vlan 10
[3Com-Vlan10] port Ethernet1/0/1
```

3 Configuration on Switch C

# Enable MSTP.

```
<3Com> system-view
[3Com] stp enable
```

# Enable VLAN-VPN tunneling.

```
[3Com] vlan-vpn tunnel
```

# Add Ethernet 1/0/1 to VLAN 10.

```
[3Com] vlan 10
[3Com-Vlan10] port Ethernet1/0/1
[3Com-Vlan10] quit
```

# Enable VLAN VPN.

```
[3Com] interface Ethernet1/0/1
[3Com-Ethernet1/0/1] vlan-vpn enable
[3Com-Ethernet1/0/1] quit
```

# Configure Ethernet 1/0/2 as a trunk port.

```
[3Com] interface Ethernet1/0/2
[3Com-Ethernet1/0/2] port link-type trunk
```

# Add the trunk port Ethernet 1/0/2 to all the VLANs.

```
[3Com-Ethernet1/0/2] port trunk permit vlan all
```

4 Configuration on Switch D

# Enable MSTP.

```
<3Com> system-view
[3Com] stp enable
```

# Enable VLAN-VPN tunneling.

```
[3Com] vlan-vpn tunnel
```

# Add Ethernet 1/0/2 to VLAN 10.

```
[3Com] vlan 10
[3Com-Vlan10] port Ethernet1/0/2
```

# Enable VLAN VPN.

```
[3Com] interface Ethernet1/0/2
[3Com-Ethernet1/0/2] vlan-vpn enable
[3Com-Ethernet1/0/2] quit
```

# Configure Ethernet 1/0/1 as a trunk port.

```
[3Com] interface Ethernet1/0/1
[3Com-Ethernet1/0/1] port link-type trunk
```

# Add the trunk port Ethernet 1/0/1 to all the VLANs.

```
[3Com-Ethernet1/0/1] port trunk permit vlan all
```

Complete Configuration

1 Configuration on Switch A

```
#
stp enable
#
interface Ethernet1/0/1
 port access vlan 10
#
```

2 Configuration on Switch B

```
#
 stp enable
#
interface Ethernet1/0/1
 port access vlan 10
#
```

3 Configuration on Switch C

```
#
stp enable
#
vlan-vpn tunnel
#
interface Ethernet1/0/1
 port access vlan 10
 vlan-vpn enable
#
interface Ethernet1/0/2
 port link-type trunk
 port trunk permit vlan all
#
```

4 Configuration on Switch D

```
#
stp enable
#
vlan-vpn tunnel
#
interface Ethernet1/0/2
 port access vlan 10
 vlan-vpn enable
#
interface Ethernet1/0/1
 port link-type trunk
 port trunk permit vlan all
#
```

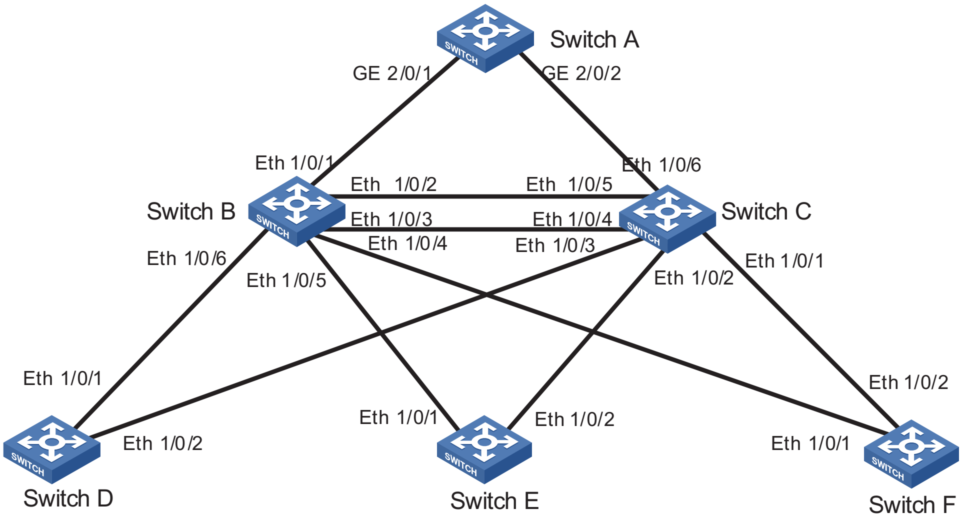
Configuring RSTP

The Rapid Spanning Tree Protocol (RSTP) optimizes STP. RSTP allows a newly elected root port or designated port to enter the forwarding state much quicker under certain conditions than in STP. As a result, it takes a shorter time for the network topology to become stable.

Although RSTP support rapid network convergence, it has the same drawback as STP does: all bridges within a LAN share the same spanning tree, so redundant links cannot be blocked based on VLANs, and the packets of all VLANs are forwarded along the same spanning tree.

Network Diagram

Figure 24 Network diagram for RSTP configuration



Networking and Configuration Requirements

- Switch A is operating at the core.
- Switch B and Switch C are operating at the distribution layer.
- Switch D, Switch E, and Switch F are operating at the access layer.

At the distribution layer:

- Switch C is operating as the backup switch of Switch B. When Switch B fails, Switch C takes over.
- Switch C and Switch B are connected through two links. When a link fails, another link takes over.

At the access layer:

- Switch D, Switch E, and Switch F are directly connected to PCs.
- Switch D, Switch E, and Switch F are connected to Switch C and Switch B.

In the configuration procedure below, only RSTP-related configurations are provided. Switch A is the root bridge. Switch D through Switch F are mostly consistent in the configuration, so only the configuration on Switch D is listed.

- *In most cases, Switch A is a high-end switch or middle-range switch, such as Switch 8800 or Switch 7750.*
- *In most cases, Switch B and Switch C are stackable switches such as the Switch 5500 and Switch 5500G.*
- *In most cases, Switch D, Switch E, and Switch F are stackable switches such as the Switch 4210 and the Switch 4200G.*

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions

Product series	Software version	Hardware version
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

1 Configuration on Switch A

# Enable MSTP.

```
<3Com> system-view
[3Com] stp enable
```

# Enabling MSTP globally on the switch enables RSTP on all the ports. Disable MSTP on the ports that are not involved in RSTP calculation, for example GigabitEthernet 2/0/4.

```
[3Com] interface GigabitEthernet 2/0/4
[3Com-GigabitEthernet2/0/4] stp disable
```

# Configure Switch A as the root bridge in one of the following two methods:

- Set the bridge priority of Switch A to 0.

```
[3Com] stp priority 0
```

- Use the following command to specify Switch A as the root bridge.

```
[3Com] stp root primary
```

# Enable the root guard function on the designated ports connected to Switch B and Switch C.

```
[3Com] interface GigabitEthernet 2/0/1
[3Com-GigabitEthernet2/0/1] stp root-protection
[3Com-GigabitEthernet2/0/1] quit
[3Com] interface GigabitEthernet 2/0/2
[3Com-GigabitEthernet2/0/2] stp root-protection
[3Com-GigabitEthernet2/0/2] quit
```

# Enable the TC-BPDU attack guard function on Switch A.

```
[3Com] stp tc-protection enable
```

2 Configuration on Switch B

# Enable MSTP.

```
<3Com> system-view
[3Com] stp enable
```

# Enabling MSTP globally on the switch enables RSTP on all the ports. Disable MSTP on the ports that are not involved in RSTP calculation, for example Ethernet 1/0/8.

```
[3Com] interface Ethernet 1/0/8
[3Com-Ethernet1/0/8] stp disable
[3Com-Ethernet1/0/8] quit
```

# Configure Switch C and Switch B to back up each other, and set the bridge priority of Switch B to 4096.

```
[3Com] stp priority 4096
```

# Enable the root guard function on each designated port.

```
[3Com] interface Ethernet 1/0/4
[3Com-Ethernet1/0/4] stp root-protection
[3Com-Ethernet1/0/4] quit
[3Com] interface Ethernet 1/0/5
[3Com-Ethernet1/0/5] stp root-protection
[3Com-Ethernet1/0/5] quit
[3Com] interface Ethernet 1/0/6
[3Com-Ethernet1/0/6] stp root-protection
[3Com-Ethernet1/0/6] quit
```

# Adopt the default MSTP operation mode, time-related parameters, and port parameters.

3 Configuration on Switch C

# Enable MSTP.

```
<3Com> system-view
[3Com] stp enable
```

# Enabling MSTP globally on the switch enables RSTP on all the ports. Disable MSTP on the ports that are not involved in RSTP calculation, for example Ethernet 1/0/8.

```
[3Com] interface Ethernet 1/0/8
[3Com-Ethernet1/0/8] stp disable
[3Com-Ethernet1/0/8] quit
```

# Configure Switch C and Switch B to back up each other, and set the bridge priority of Switch C to 8192.

```
[3Com] stp priority 8192
```

# Enable the root guard function on each designated port.

```
[3Com] interface Ethernet 1/0/1
[3Com-Ethernet1/0/1] stp root-protection
[3Com-Ethernet1/0/1] quit
[3Com] interface Ethernet 1/0/2
[3Com-Ethernet1/0/2] stp root-protection
[3Com-Ethernet1/0/2] quit
[3Com] interface Ethernet 1/0/3
[3Com-Ethernet1/0/3] stp root-protection
[3Com-Ethernet1/0/3] quit
```

# Adopt the default MSTP operation mode, time-related parameters, and port parameters.

4 Configuration on Switch D

# Enable MSTP.

```
<3Com> system-view
[3Com] stp enable
```

# Enabling MSTP globally on the switch enables RSTP on all the ports. Disable MSTP on the ports that are not involved in RSTP calculation, for example Ethernet 1/0/3.

```
[3Com] interface Ethernet 1/0/3
[3Com-Ethernet1/0/3] stp disable
```

# Configure the ports directly connected to users as edge ports and enable the BPDU guard function on these ports. Take Ethernet 1/0/3 for example.

```
[3Com-Ethernet1/0/3] stp edged-port enable
[3Com-Ethernet1/0/3] quit
[3Com] stp bpdu-protection
```

# Adopt the default MSTP operation mode, time-related parameters, and port parameters.

# The configuration on Switch E and Switch F are the same as that on Switch D.

Complete Configuration

1 Configuration on Switch A

```
#
stp instance 0 priority 0
(stp instance 0 root primary)
stp TC-protection enable
stp enable
#
interface GigabitEthernet2/0/1
 stp root-protection
#
interface GigabitEthernet2/0/2
 stp root-protection
#
interface GigabitEthernet2/0/4
 stp disable
#
```

2 Configuration on Switch B

```
#
stp instance 0 priority 4096
stp enable
#
interface Ethernet1/0/4
 stp root-protection
#
interface Ethernet1/0/5
 stp root-protection
#
interface Ethernet1/0/6
 stp root-protection
#
```

```
interface Ethernet1/0/8
 stp disable
#
```

3 Configuration on Switch C

```
#
stp instance 0 priority 8192
stp enable
#
interface Ethernet1/0/1
 stp root-protection
#
interface Ethernet1/0/2
 stp root-protection
#
interface Ethernet1/0/3
 stp root-protection
#
interface Ethernet1/0/8
 stp disable
#
```

4 Configuration on Switch D

```
#
stp enable
#
interface Ethernet1/0/3
 stp disable
 interface Ethernet3/0/5
 stp edged-port enable
 stp bpdu-protection
#
```

Configuring Digest Snooping and Rapid Transition

Digest Snooping

On a network comprised of devices of multiple vendors, 3Com switches cannot interoperate with switches that run proprietary spanning tree protocols in the same MSTP region, even if they are configured with the same MST region-related settings.

To address the problem, you can enable digest snooping on the ports connected to switches running proprietary spanning tree protocols.

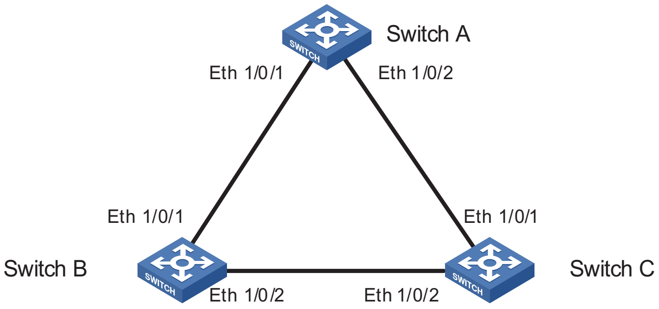
Rapid Transition

The proprietary spanning tree protocols of some vendors provide port state transition mechanisms similar to RSTP. For a switch running such a proprietary protocol, its rapid port state transition mechanism may fail on the designation port when the switch is downlinked to an MSTP-enabled 3Com switch.

To address the problem, you can enable the rapid transition feature on the downstream 3Com switch.

Network Diagram

Figure 25 Network diagram for digest snooping and rapid transition configuration



Networking and Configuration Requirements

- Use another vendor's switch, Switch A in this scenario, as the root switch.
- Switch B and Switch C are connected to Switch A.

For Switch B:

- Set the priority of Switch B to 4096.
- Enable rapid transition and digest snooping on Switch B.

For Switch C:

- Set the priority of Switch C to 8192.
- Enable rapid transition and digest snooping on Switch C.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

1 Configuration on Switch B

# Enable MSTP.

```
<3Com> system-view
[3Com] stp enable
```

# Set the priority of Switch B to 4096.

```
[3Com] stp priority 4096
```

# Enable digest snooping on Switch B.

```
[3Com] stp config-digest-snooping
```

# Enable digest snooping on the root port Ethernet 1/0/1.

```
[3Com] interface Ethernet 1/0/1
[3Com-Ethernet1/0/1] stp config-digest-snooping
```

# Enable rapid transition on the root port Ethernet 1/0/1.

```
[3Com-Ethernet1/0/1] stp no-agreement-check
[3Com-Ethernet1/0/1] quit
```

2 Configuration on Switch C

# Enable MSTP.

```
<3Com> system-view
[3Com] stp enable
```

# Set the priority of Switch C to 8192.

```
[3Com] stp priority 8192
```

# Enable digest snooping on Switch C.

```
[3Com] stp config-digest-snooping
```

# Enable digest snooping on the root port Ethernet 1/0/2.

```
[3Com] interface Ethernet 1/0/2
[3Com-Ethernet1/0/2] stp config-digest-snooping
[3Com-Ethernet1/0/2] quit
```

# Enable rapid transition on Ethernet 1/0/1.

```
[3Com] interface Ethernet 1/0/1
[3Com-Ethernet1/0/1] stp no-agreement-check
[3Com-Ethernet1/0/1] quit
```

- *The rapid transition feature can be enabled only on root ports or alternate ports.*
- *You can enable rapid transition on a designated port, but the configuration cannot take effect on the port.*

Complete Configuration

1 Configuration on Switch B

```
#
 stp enable
stp instance 0 priority 4096
stp config-digest-snooping
#
interface Ethernet1/0/1
 stp config-digest-snooping
 stp no-agreement-check
#
```

2 Configuration on Switch C

```
#
 stp enable
stp instance 0 priority 8192
stp config-digest-snooping
#
interface Ethernet1/0/1
 stp no-agreement-check
#
interface Ethernet1/0/2
 stp config-digest-snooping
#
```

15 ROUTING CONFIGURATION GUIDE

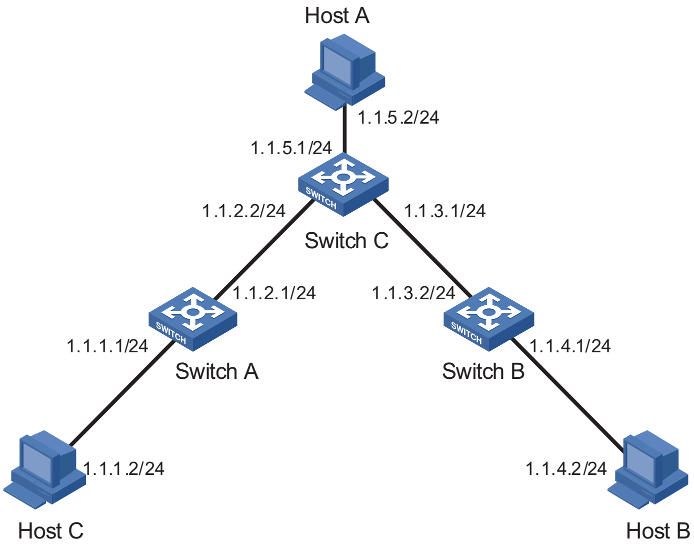
Configuring Static Routes

A static route is manually configured by an administrator. In a simple network, you only need to configure static routes to make the network work normally. The proper configuration and usage of static routes can improve network performance and ensure the bandwidth for important applications. However, if a fault occurs to the network, the corresponding static routes cannot be updated dynamically, and the network administrator has to modify the static routes manually.

For two devices to be reachable to each other, you need to configure a static route to the peer on each device.

Network Diagram

Figure 26 Network diagram for static route configuration



Networking and Configuration Requirements

A small company has a simple and stable office network. The company's existing devices that do not support dynamic routing protocols. The company requires that any two nodes on the network can communicate with each other and that the existing devices can be fully utilized.

In this case, static routes can enable communication between any two nodes on the network.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions

Product series	Software version	Hardware version
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

Configure the switches:

- Configure static routes on Switch A.

```
<SwitchA> system-view
[SwitchA] ip route-static 1.1.3.0 255.255.255.0 1.1.2.2
[SwitchA] ip route-static 1.1.4.0 255.255.255.0 1.1.2.2
[SwitchA] ip route-static 1.1.5.0 255.255.255.0 1.1.2.2
```

- Configure static routes on Switch B.

```
<SwitchB> system-view
[SwitchB] ip route-static 1.1.2.0 255.255.255.0 1.1.3.1
[SwitchB] ip route-static 1.1.5.0 255.255.255.0 1.1.3.1
[SwitchB] ip route-static 1.1.1.0 255.255.255.0 1.1.3.1
```

- Configure static routes on Switch C.

```
<SwitchC> system-view
[SwitchC] ip route-static 1.1.1.0 255.255.255.0 1.1.2.1
[SwitchC] ip route-static 1.1.4.0 255.255.255.0 1.1.3.2
```

Configure the hosts:

# Configure the default gateway of Host A as 1.1.5.1. Detailed configuration procedure is omitted.

# Configure the default gateway of Host B as 1.1.4.1. Detailed configuration procedure is omitted.

# Configure the default gateway of Host C as 1.1.1.1. Detailed configuration procedure is omitted.

Complete Configuration

- Perform the following configuration on Switch A.

```
#
ip route-static 1.1.3.0 255.255.255.0 1.1.2.2 preference 60
ip route-static 1.1.4.0 255.255.255.0 1.1.2.2 preference 60
ip route-static 1.1.5.0 255.255.255.0 1.1.2.2 preference 60
```

- Perform the following configuration on Switch B.

```
#
ip route-static 1.1.2.0 255.255.255.0 1.1.3.1 preference 60
ip route-static 1.1.5.0 255.255.255.0 1.1.3.1 preference 60
ip route-static 1.1.1.0 255.255.255.0 1.1.3.1 preference 60
```

- Perform the following configuration on Switch C.

```
#
ip route-static 1.1.1.0 255.255.255.0 1.1.2.1 preference 60
ip route-static 1.1.4.0 255.255.255.0 1.1.3.2 preference 60
```

Precautions

Note the following when configuring a static route:

- If the nexthop of a static route is indirectly connected, the static route takes effect (that is, it is installed into the routing table) only if a route to the nexthop exists in the routing table.

- You cannot configure the next hop of a static route as the address of an interface on the local switch.
- You can configure different preferences or an identical preference for routes to the same destination for route backup or load sharing.
- The default route has both the destination and mask configured as 0.0.0.0. If the destination IP address of a packet does not match any entry in the routing table, the router will select the default route to forward the packet

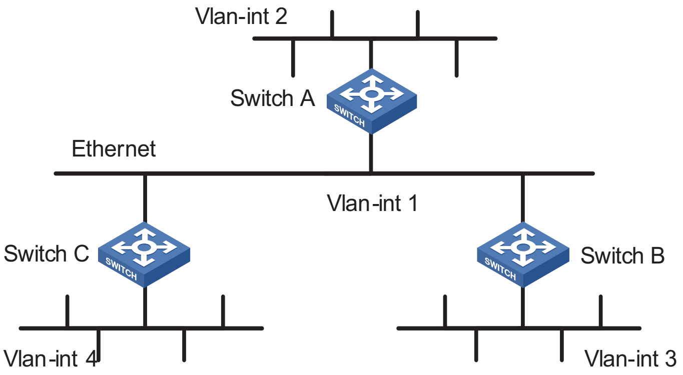
Configuring RIP

RIP is a Distance-Vector (D-V) routing protocol. It advertises routing information in User Datagram Protocol (UDP) datagrams.

RIP uses a hop count, or a routing cost, as the metric to a destination. The hop count from a router to a directly connected network is 0, and that to a network which can be reached through another router is 1, and so on. To restrict the convergence time, RIP prescribes that a cost is an integer ranging from 0 and 15. A hop count equal to or exceeding 16 is defined as infinite; that is, the destination network or the host is unreachable. To improve performance and avoid routing loops, RIP supports split horizon. Besides, RIP can redistribute routes from other routing protocols.

Network Diagram

Figure 27 Network diagram for RIP configuration



Device	Interface	IP address	Device	Interface	IP address
Switch A	Vlan-int1	110.11.2.1/24	Switch B	Vlan-int1	110.11.2.2/24
	Vlan-int2	155.10.1.1/24		Vlan-int3	196.38.165.1/24
Switch C	Vlan-int1	110.11.2.3/24			
	Vlan-int4	117.102.0.1/16			

Networking and Configuration Requirements

A small company requires a small office network where any two nodes can communicate with each other, and the network devices can automatically adapt to topology changes.

In this case, RIPv2 can enable communication between any two nodes on the network.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions

Product series	Software version	Hardware version
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

- Configure Switch A.

# Configure RIP.

```
<SwitchA> system-view
[SwitchA] interface Vlan-interface 1
[SwitchA-Vlan-interface1] ip address 110.11.2.1 24
[SwitchA-Vlan-interface1] rip version 2
[SwitchA-Vlan-interface1] quit
[SwitchA] interface Vlan-interface 2
[SwitchA-Vlan-interface2] ip address 155.10.1.1 24
[SwitchA-Vlan-interface2] rip version 2
[SwitchA-Vlan-interface2] quit
[SwitchA] rip
[SwitchA-rip] undo summary
[SwitchA-rip] network 110.11.2.0
[SwitchA-rip] network 155.10.1.0
```

- Configure Switch B.

# Configure RIP.

```
<SwitchB> system-view
[SwitchB] interface Vlan-interface 1
[SwitchB-Vlan-interface1] ip address 110.11.2.2 24
[SwitchB-Vlan-interface1] rip version 2
[SwitchB-Vlan-interface1] quit
[SwitchB] interface Vlan-interface 3
[SwitchB-Vlan-interface3] ip address 196.38.165.1 24
[SwitchB-Vlan-interface3] rip version 2
[SwitchB-Vlan-interface3] quit
[SwitchB] rip
[SwitchB-rip] undo summary
[SwitchB-rip] network 196.38.165.0
[SwitchB-rip] network 110.11.2.0
```

- Configure Switch C.

# Configure RIP.

```
<SwitchC> system-view
[SwitchC] interface Vlan-interface 1
[SwitchC-Vlan-interface1] ip address 110.11.2.3 24
[SwitchC-Vlan-interface1] rip version 2
[SwitchC-Vlan-interface1] quit
[SwitchC] interface Vlan-interface 4
[SwitchC-Vlan-interface4] ip address 117.102.0.1 16
[SwitchC-Vlan-interface4] rip version 2
[SwitchC-Vlan-interface4] quit
[SwitchC] rip
[SwitchC-rip] undo summary
[SwitchC-rip] network 117.102.0.0
[SwitchC-rip] network 110.11.2.0
```

Complete Configuration

- Perform the following configuration on Switch A.

```
#
vlan 1
#
vlan 2
#
interface Vlan-interface1
 ip address 110.11.2.1 255.255.255.0
 rip version 2 multicast
#
interface Vlan-interface2
 ip address 155.10.1.1 255.255.255.0
 rip version 2 multicast
#
rip
 undo summary
 network 110.0.0.0
 network 155.10.0.0
#
```

- Perform the following configuration on Switch B.

```
#
vlan 1
#
vlan 3
#
interface Vlan-interface1
 ip address 110.11.2.2 255.255.255.0
 rip version 2 multicast
#
interface Vlan-interface3
 ip address 196.38.165.1 255.255.255.0
 rip version 2 multicast
#
rip
 undo summary
 network 196.38.165.0
 network 110.0.0.0
```

- Perform the following configuration on Switch C.

```
#
vlan 1
#
vlan 4
#
interface Vlan-interface1
 ip address 110.11.2.3 255.255.255.0
 rip version 2 multicast
#
interface Vlan-interface4
 ip address 117.102.0.1 255.255.0.0
 rip version 2 multicast
#
rip
 undo summary
 network 117.0.0.0
 network 110.0.0.0
```

Precautions

- RIPv2 supports automatic route summarization (with the **summary** command). This function is enabled by default.
- Based on your needs, you can configure the switch to receive or send RIP packets with the **rip input** command or the **rip output** command.
- RIPv2 can transmit packets in two modes: broadcast and multicast. By default, RIPv2 transmits packets in the multicast mode.

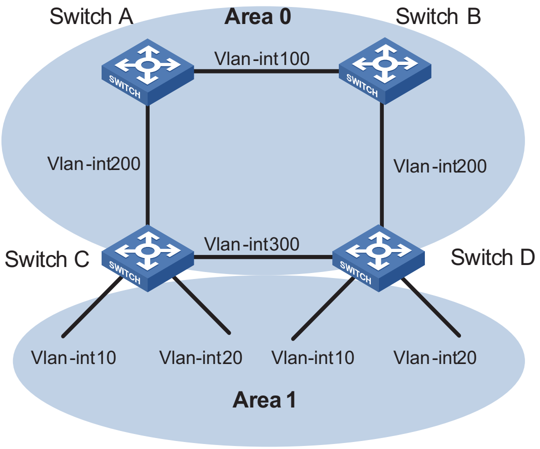
Configuring OSPF

Open Shortest Path First (OSPF) is a link state interior gateway protocol developed by IETF. At present, OSPF version 2 (RFC 2328) is used. OSPF has the following features:

- Wide-spread application
- Fast convergence
- Loop-free
- Multicast transmission
- Area partition
- Routing hierarchy
- Authentication

Network Diagram

Figure 28 Network diagram for OSPF basic configuration



Device	Interface	IP address	Router ID
Switch A	Vlan-int100	10.1.1.1/24	1.1.1.1
	Vlan-int200	10.1.2.1/24	
Switch B	Vlan-int100	10.1.1.2/24	2.2.2.2
	Vlan-int200	10.1.3.1/24	
Switch C	Vlan-int200	10.1.2.2/24	3.3.3.3
	Vlan-int300	10.1.4.1/24	
	Vlan-int10	192.168.1.1/24	
	Vlan-int20	192.168.2.1/24	

Switch D	Vlan-int200	10.1.3.2/24	4.4.4.4
	Vlan-int300	10.1.4.2/24	
	Vlan-int10	192.168.10.1/24	
	Vlan-int20	192.168.20.1/24	

Networking and Configuration Requirements

Network devices run OSPF to forward packets. For network security, disable the device interfaces not enabled with OSPF from sending OSPF packets.

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

- Configure Switch A.

# Create VLANs and configure IP addresses for VLAN interfaces. The configuration procedure is omitted.

# Configure OSPF.

```
<SwitchA> system-view
[SwitchA] ospf 1 router-id 1.1.1.1
[SwitchA-ospf-1] area 0
[SwitchA-ospf-1-area-0.0.0.0] network 10.1.1.0 0.0.0.255
[SwitchA-ospf-1-area-0.0.0.0] network 10.1.2.0 0.0.0.255
[SwitchA-ospf-1-area-0.0.0.0] quit
[SwitchA-ospf-1] quit
```

- Configure Switch B (refer to “Configure Switch A.” on page 99).
- Configure Switch C.

# Create VLANs and configure IP addresses for VLAN interfaces. The configuration procedure is omitted.

# Configure OSPF.

```
<SwitchC> system-view
[SwitchC] router id 3.3.3.3
```

# Disable the interfaces from sending OSPF packets.

```
[SwitchC] ospf
[SwitchC-ospf-1] silent-interface Vlan-interface 10
[SwitchC-ospf-1] silent-interface Vlan-interface 20
```

# Enable the interfaces in the specified areas to run OSPF.

```
[SwitchC-ospf-1] area 0
[SwitchC-ospf-1-area-0.0.0.0] network 10.1.2.0 0.0.0.255
[SwitchC-ospf-1-area-0.0.0.0] network 10.1.4.0 0.0.0.255
[SwitchC-ospf-1-area-0.0.0.0] quit
[SwitchC-ospf-1] area 1
[SwitchC-ospf-1-area-0.0.0.1] network 192.168.1.0 0.0.0.255
```

```
[SwitchC-ospf-1-area-0.0.0.1] network 192.168.2.0 0.0.0.255
[SwitchC-ospf-1-area-0.0.0.1] quit
[SwitchC-ospf-1] quit
```

- Configure Switch D (refer to "Configure Switch C." on page 99).

Complete Configuration

- Perform the following configuration on Switch A.

```
#
vlan 100
#
vlan 200
#
interface Vlan-interface100
 ip address 10.1.1.1 255.255.255.0
#
interface Vlan-interface200
 ip address 10.1.2.1 255.255.255.0
#
ospf 1 router-id 1.1.1.1
 area 0.0.0.0
  network 10.1.1.0 0.0.0.255
  network 10.1.2.0 0.0.0.255
#
```

- Perform the following configuration on Switch B.

```
#
vlan 100
#
vlan 200
#
interface Vlan-interface100
 ip address 10.1.1.2 255.255.255.0
#
interface Vlan-interface200
 ip address 10.1.3.1 255.255.255.0
#
ospf 1 router-id 2.2.2.2
 area 0.0.0.0
  network 10.1.1.0 0.0.0.255
  network 10.1.3.0 0.0.0.255
#
```

- Perform the following configuration on Switch C.

```
#
 router id 3.3.3.3
#
vlan 10
#
vlan 20
#
vlan 200
#
vlan 300
#
interface Vlan-interface10
 ip address 192.168.1.1 255.255.255.0
#
```

```
interface Vlan-interface20
 ip address 192.168.2.1 255.255.255.0
#
interface Vlan-interface200
 ip address 10.1.2.2 255.255.255.0
#
interface Vlan-interface300
 ip address 10.1.4.1 255.255.255.0
#
ospf 1
silent-interface Vlan-interface10
 silent-interface Vlan-interface20
 area 0.0.0.1
  network 192.168.1.0 0.0.0.255
  network 192.168.2.0 0.0.0.255
#
 area 0.0.0.0
  network 10.1.2.0 0.0.0.255
  network 10.1.4.0 0.0.0.255
#
```

- Perform the following configuration on Switch D.

```
#
 router id 4.4.4.4
#
vlan 10
#
vlan 20
#
vlan 200
#
vlan 300
#
interface Vlan-interface10
 ip address 192.168.10.1 255.255.255.0
#
interface Vlan-interface20
 ip address 192.168.20.1 255.255.255.0
#
interface Vlan-interface200
 ip address 10.1.3.2 255.255.255.0
#
interface Vlan-interface300
 ip address 10.1.4.2 255.255.255.0
#
ospf 1
 silent-interface Vlan-interface10
 silent-interface Vlan-interface20
 area 0.0.0.1
  network 192.168.10.0 0.0.0.255
  network 192.168.20.0 0.0.0.255
#
 area 0.0.0.0
  network 10.1.3.0 0.0.0.255
  network 10.1.4.0 0.0.0.255
#
```

Precautions

- Before configuring OSPF basic functions, configure a router ID for each OSPF process to ensure OSPF runs normally. You are recommended to use the **ospf** command to configure router IDs for the processes, especially on a device running multiple processes.
- To prevent route leaking and enhance network security, use the **silent-interface** command on the interfaces not running OSPF to disable them from sending OSPF packets.

Configuring OSPF DR Election

On broadcast or NBMA networks, any two routers need to exchange routing information with each other. If n routers are present on a network, n × (n-1)/2 adjacencies are required. Any route change on a router in such a network generates traffic for routing information synchronization, consuming network resources. The Designated Router (DR) is defined to solve the problem. All the other routers on the network send routing information to the DR, which is responsible for advertising link state information.

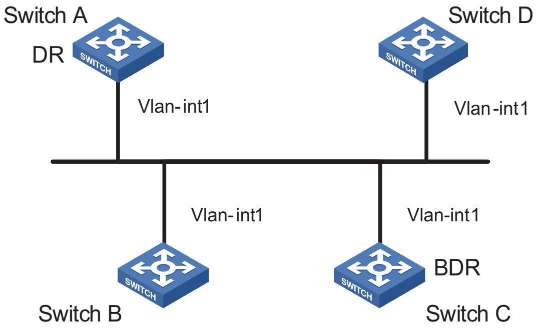
On a network, a BDR is elected along with a DR and establishes adjacencies with all the other routers for routing information exchange. When the DR fails, the BDR will become the new DR in a very short period by avoiding adjacency establishment and DR re-election. Meanwhile, other routers elect another BDR, which requires a relatively long period but has no influence on routing calculation.

A router that is neither a DR nor a BDR is a DRother. It forms adjacencies with the DR and BDR, but it neither establishes adjacencies nor exchange routing information with each other, thus reducing the number of adjacencies on broadcast and NBMA networks.

The DR and BDR in a network are elected by all the routers attached to the network. The DR priority of an interface determines its qualification for DR/BDR election. Interfaces attached to the network and having priorities higher than 0 are election candidates. The election votes are hello packets.

Network Diagram

Figure 29 Network diagram for DR/BDR election



Device	Interface	IP address	Router ID	Interface priority
Switch A	Vlan-int1	196.1.1.1/24	1.1.1.1	100
Switch B	Vlan-int1	196.1.1.2/24	2.2.2.2	0
Switch C	Vlan-int1	196.1.1.3/24	3.3.3.3	2
Switch D	Vlan-int1	196.1.1.4/24	4.4.4.4	1

Networking and Configuration Requirements

Use OSPF to enable communication between devices in a broadcast network. Devices with higher performance should become the DR and BDR to improve network performance. Disable the devices with lower performance from taking part in the DR/BDR election.

Based on the customer requirements and networking environment, assign proper priorities to interfaces.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

- Configure Switch A.

# Assign a router ID to Switch A.

```
<SwitchA> system-view
[SwitchA] router id 1.1.1.1
```

# Configure an IP address for the VLAN interface.

```
[SwitchA] interface Vlan-interface 1
[SwitchA-Vlan-interface1] ip address 196.1.1.1 255.255.255.0
```

# Assign a DR priority to the VLAN interface.

```
[SwitchA-Vlan-interface1] ospf dr-priority 100
[SwitchA-Vlan-interface1] quit
```

# Enable OSPF and specify the VLAN interface to belong to OSPF area 0.

```
[SwitchA] ospf
[SwitchA-ospf-1] area 0
[SwitchA-ospf-1-area-0.0.0.0] network 196.1.1.0 0.0.0.255
```

- Configure Switch B.

# Assign a router ID to Switch B.

```
<SwitchB> system-view
[SwitchB] router id 2.2.2.2
```

# Configure the IP address of the VLAN interface attached to area 0 and assign a DR priority to the interface. Enable OSPF and specify the VLAN interface to belong to area 0.

```
[SwitchB] interface Vlan-interface 1
[SwitchB-Vlan-interface1] ip address 196.1.1.2 255.255.255.0
[SwitchB-Vlan-interface1] ospf dr-priority 0
[SwitchB-Vlan-interface1] quit
[SwitchB] ospf
[SwitchB-ospf-1] area 0
[SwitchB-ospf-1-area-0.0.0.0] network 196.1.1.0 0.0.0.255
```

```
[SwitchB-ospf-1-area-0.0.0.0] quit
[SwitchB-ospf-1] quit
```

- Configure Switch C.

# Assign a router ID to Switch C.

```
<SwitchC> system-view
[SwitchC] router id 3.3.3.3
```

# Configure an IP address for the VLAN interface.

```
[SwitchC] interface Vlan-interface 1
[SwitchC-Vlan-interface1] ip address 196.1.1.3 255.255.255.0
```

# Assign a DR priority to the VLAN interface.

```
[SwitchC-Vlan-interface1] ospf dr-priority 2
[SwitchC-Vlan-interface1] quit
```

# Enable OSPF and specify the VLAN interface to belong to area 0.

```
[SwitchC] ospf
[SwitchC-ospf-1] area 0
[SwitchC-ospf-1-area-0.0.0.0] network 196.1.1.0 0.0.0.255
```

- Configure Switch D.

# Assign a router ID to Switch D.

```
<SwitchD> system-view
[SwitchD] router id 4.4.4.4
```

# Configure an IP address for the VLAN interface.

```
[SwitchD] interface Vlan-interface 1
[SwitchD-Vlan-interface1] ip address 196.1.1.4 255.255.255.0
[SwitchD-Vlan-interface1] quit
```

# Enable OSPF and specify the VLAN interface to belong to area 0.

```
[SwitchD] ospf
[SwitchD-ospf-1] area 0
[SwitchD-ospf-1-area-0.0.0.0] network 196.1.1.0 0.0.0.255
```

Complete Configuration

- Perform the following configuration on Switch A.

```
#
 router id 1.1.1.1
#
vlan 1
#
interface Vlan-interface 1
 ip address 196.1.1.1 255.255.255.0
 ospf dr-priority 100
#
ospf 1
```

```
 area 0.0.0.0
  network 196.1.1.0 0.0.0.255
```

- Perform the following configuration on Switch B.

```
#
 router id 2.2.2.2
#
vlan 1
#
interface Vlan-interface 1
 ip address 196.1.1.2 255.255.255.0
 ospf dr-priority 0
#
ospf 1
 area 0.0.0.0
  network 196.1.1.0 0.0.0.255
```

- Perform the following configuration on Switch C.

```
#
 router id 3.3.3.3
#
vlan 1
#
interface Vlan-interface 1
 ip address 196.1.1.3 255.255.255.0
 ospf dr-priority 2
#
ospf 1
 area 0.0.0.0
  network 196.1.1.0 0.0.0.255
```

- Perform the following configuration on Switch D.

```
#
 router id 4.4.4.4
#
vlan 1
#
interface Vlan-interface 1
 ip address 196.1.1.4 255.255.255.0
#
ospf 1
 area 0.0.0.0
  network 196.1.1.0 0.0.0.255
```

Precautions

- The DR election is performed only on broadcast and NBMA interfaces rather than P2P or P2MP interfaces.
- A DR is an interface of a router and belongs to a single network segment. A router's interface may be a DR, while another interface of the router may be a BDR or DRother.
- The DR priority of a router interface affects the DR and BDR election. However, it does not effect the election immediately after the DR and BDR election ends. A new DR priority assigned to a router interface takes effect at the time of next DR and BDR election.
- A DR may not be a router interface with the highest priority in a network, and a BDR may not be a router interface with the second highest priority.

Configuring a (Totally) Stub Area

When a large number of OSPF routers are present on a network, the LSDB of routers may become so large that a great amount of storage space is occupied and CPU resources are exhausted when performing the SPF computation.

In addition, as the topology of a large network is prone to changes, enormous OSPF packets may be created, reducing bandwidth utilization. Each topology change makes all the routers perform a route recalculation.

To address this issue, OSPF divides an AS into multiple areas.

Backbone area

The area ID of the backbone area is 0. The backbone area is responsible for distributing routing information between none-backbone areas. Routing information of non-backbone areas must be forwarded by the backbone area.

(Totally) Stub area

The ABR in a stub area does not distribute Type-5 LSAs into the area, so the routing table size in this area is reduced significantly.

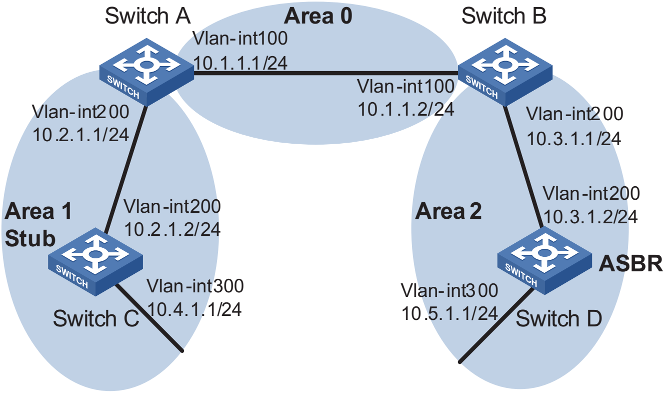
To further reduce the routing table size in a stub area, you can configure the stub area as a totally stub area, where the ABR advertises neither the addresses of other areas nor the external routes.

NSSA area

Similar to a stub area, a Not So Stubby Area (NSSA) area imports no Type-5 LSAs but can import Type-7 LSAs that are generated by the ASBR and distributed throughout the NSSA area. After reaching the NSSA ABR, Type-7 LSAs are translated into Type-5 LSAs by the ABR for advertisement to other areas.

Network Diagram

Figure 30 Network diagram for (Totally) stub area configuration



Networking and Configuration Requirements

Run OSPF on the network devices. Configure a (totally) stub area to reduce the routing table size.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions

Product series	Software version	Hardware version
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

Non-backbone area and backbone area configuration (area 1 is a non-backbone area)

- Configure Switch A.

# Create VLANs and configure IP addresses for the VLAN interfaces. The configuration procedure is omitted.

# Configure OSPF for area 1.

```
<SwitchA> system-view
[SwitchA] ospf 1 router-id 1.1.1.1
[SwitchA-ospf-1] area 1
[SwitchA-ospf-1-area-0.0.0.1] network 10.2.1.0 0.0.0.255
```

# Configure OSPF for the backbone area.

```
[SwitchA-ospf-1] area 0
[SwitchA-ospf-1-area-0.0.0.0] network 10.1.1.0 0.0.0.255
```

- Configure Switch B (refer to “Configure Switch A.” on page 107).
- Configure Switch C.

# Create VLANs and configure IP addresses for the VLAN interfaces. The configuration procedure is omitted.

# Configure OSPF for area 1.

```
<SwitchC> system-view
[SwitchC] ospf 1 router-id 3.3.3.3
[SwitchC-ospf-1] area 1
[SwitchC-ospf-1-area-0.0.0.1] network 10.2.1.0 0.0.0.255
[SwitchC-ospf-1-area-0.0.0.1] network 10.4.1.0 0.0.0.255
```

- Configure Switch D.

# Create VLANs and configure IP addresses for the VLAN interfaces. The configuration procedure is omitted.

# Configure a static route of 1.0.0.0/8.

```
<SwitchD> system-view
[SwitchD] ip route-static 1.0.0.0 8 10.5.1.2
```

# Configure OSPF for area 2.

```
[SwitchD] ospf 1 router-id 4.4.4.4
[SwitchD-ospf-1] area 2
[SwitchD-ospf-1-area-0.0.0.2] network 10.3.1.0 0.0.0.255
[SwitchD-ospf-1-area-0.0.0.2] network 10.5.1.0 0.0.0.255
[SwitchD-ospf-1-area-0.0.0.2] quit
```

# Redistribute the static route to specify Switch D as an ASBR.

```
[SwitchD-ospf-1] import-route static
[SwitchD-ospf-1] quit
```

- *The above-mentioned steps configure non-backbone areas, backbone area, and ABRs/ASBRs.*
- *By using the* ***display ospf lsdb*** *command on Switch C, you can see that Type-3 LSAs, Type-4 LSAs, and Type-5 LSAs exist in the link state database (LSDB). You can control the generation of Type-4 LSAs and Type-5 LSAs by configuring the stub attribute.*

Configure a stub area (area 1)

Based on the configuration in "Non-backbone area and backbone area configuration (area 1 is a non-backbone area)" on page 107, perform the following steps:

# Configure area 1 as a stub area.

```
[SwitchA-ospf-1-area-0.0.0.1] stub
[SwitchC-ospf-1-area-0.0.0.1] stub
```

- *Use the* ***display ospf lsdb*** *command on Switch C to display the LSDB. You can see that no Type-4 LSAs or Type-5 LSAs exist in the LSDB. But a default Type-3 LSA is added.*

Configure a totally stub area (area 1 is a totally stub area)

Based on the configuration in "Non-backbone area and backbone area configuration (area 1 is a non-backbone area)" on page 107, perform the following steps:

# Configure area 1 as a totally stub area.

```
[SwitchA-ospf-1-area-0.0.0.1] stub no-summary
[SwitchC-ospf-1-area-0.0.0.1] stub
```

- *To configure a stub area as a totally stub area, use the* ***stub no-summary*** *command on the ABR of the stub area.*
- *Use the* ***display ospf lsdb*** *command on Switch C to display the LSDB. You can see that no Type-3 LSAs, Type-4 LSAs, or Type-5 LSAs exist in the LSDB. But a Type-3 default LSA is added.*

Complete Configuration

Configuration information when area 1 is a non-backbone area:

- Perform the following configuration on Switch A.

```
#
vlan 100
#
vlan 200
#
interface Vlan-interface100
 ip address 10.1.1.1 255.255.255.0
#
interface Vlan-interface200
```

```
 ip address 10.2.1.1 255.255.255.0
#
ospf 1 router-id 1.1.1.1
 area 0.0.0.1
  network 10.2.1.0 0.0.0.255
 #
 area 0.0.0.0
  network 10.1.1.0 0.0.0.255
#
```

- Perform the following configuration on Switch B.

```
#
vlan 100
#
vlan 200
#
interface Vlan-interface100
 ip address 10.1.1.2 255.255.255.0
#
interface Vlan-interface200
 ip address 10.3.1.1 255.255.255.0
#
ospf 1 router-id 2.2.2.2
 area 0.0.0.2
  network 10.3.1.0 0.0.0.255
 #
 area 0.0.0.0
  network 10.1.1.0 0.0.0.255
#
```

- Perform the following configuration on Switch C.

```
#
vlan 200
#
vlan 300
#
interface Vlan-interface200
 ip address 10.2.1.2 255.255.255.0
#
interface Vlan-interface300
 ip address 10.4.1.1 255.255.255.0
#
ospf 1 router-id 3.3.3.3
 area 0.0.0.1
  network 10.2.1.0 0.0.0.255
  network 10.4.1.0 0.0.0.255
#
```

- Perform the following configuration on Switch D.

```
#
vlan 200
#
vlan 300
#
interface Vlan-interface200
 ip address 10.3.1.2 255.255.255.0
#
interface Vlan-interface300
```

```
 ip address 10.5.1.1 255.255.255.0
#
ospf 1 router-id 4.4.4.4
 import-route static
 area 0.0.0.2
  network 10.3.1.0 0.0.0.255
  network 10.5.1.0 0.0.0.255
#
 ip route-static 1.0.0.0 255.0.0.0 10.5.1.2 preference 60
#
```

Configuration information when area 1 is a stub area:

- Perform the following configuration on Switch A.

```
#
vlan 100
#
vlan 200
#
interface Vlan-interface100
 ip address 10.1.1.1 255.255.255.0
#
interface Vlan-interface200
 ip address 10.2.1.1 255.255.255.0
#
ospf 1 router-id 1.1.1.1
 area 0.0.0.1
  network 10.2.1.0 0.0.0.255
  stub
 #
 area 0.0.0.0
  network 10.1.1.0 0.0.0.255
#
```

- Perform the following configuration on Switch B.

Refer to the configuration of Switch B when area 1 is a non-backbone area.

- Perform the following configuration on Switch C.

```
#
vlan 200
#
vlan 300
#
interface Vlan-interface200
 ip address 10.2.1.2 255.255.255.0
#
interface Vlan-interface300
 ip address 10.4.1.1 255.255.255.0
#
ospf 1 router-id 3.3.3.3
 area 0.0.0.1
  network 10.2.1.0 0.0.0.255
  network 10.4.1.0 0.0.0.255
  stub
#
```

- Perform the following configuration on Switch D.

Refer to the configuration of Switch D when area 1 is a non-backbone area.

Configuration information when area 1 is a totally stub area:

- Perform the following configuration on Switch A.

```
#
vlan 100
#
vlan 200
#
interface Vlan-interface100
 ip address 10.1.1.1 255.255.255.0
#
interface Vlan-interface200
 ip address 10.2.1.1 255.255.255.0
#
ospf 1 router-id 1.1.1.1
 area 0.0.0.1
  network 10.2.1.0 0.0.0.255
  stub no-summary
 #
 area 0.0.0.0
  network 10.1.1.0 0.0.0.255
#
```

- Perform the following configuration on Switch B.

Refer to the configuration of Switch B when area 1 is a non-backbone area.

- Perform the following configuration on Switch C.

Refer to the configuration of Switch C when area 1 is a stub area.

- Perform the following configuration on Switch D.

Refer to the configuration of Switch D when area 1 is a non-backbone area.

Precautions

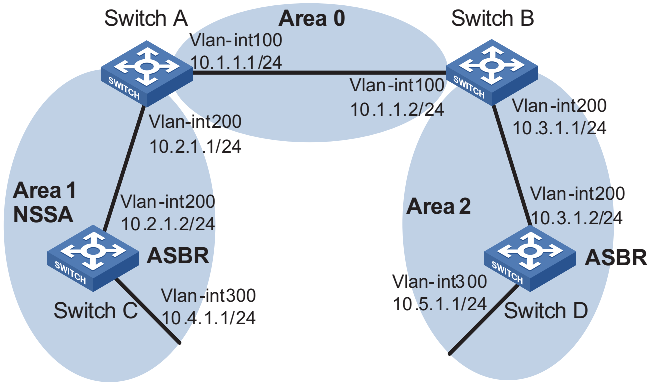
- To configure a stub area as a totally stub area, use the **stub no-summary** command on the ABR of the stub area.
- When you configure an area as a (totally) stub area, the ABR of the (totally) stub area will automatically generate a Type-3 default LSA into the area.

Configuring a (Totally) NSSA Area

Refer to “Configuring a (Totally) Stub Area” on page 106 for related information.

Network Diagram

Figure 31 Network diagram for (totally) NSSA area configuration



Networking and Configuration Requirements

Run OSPF on the network devices. Based on actual conditions, you can configure an (totally) NSSA area to reduce the routing table size in the area.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

Non-backbone area and backbone area configuration (area 1 is a non-backbone area)

- Configure Switch A.

# Create VLANs and configure IP addresses for the VLAN interfaces. The configuration procedure is omitted.

# Configure OSPF for area 1.

```
<SwitchA> system-view
[SwitchA] ospf 1 router-id 1.1.1.1
[SwitchA-ospf-1] area 1
[SwitchA-ospf-1-area-0.0.0.1] network 10.2.1.0 0.0.0.255
```

# Configure OSPF for the backbone area.

```
[SwitchA-ospf-1] area 0
[SwitchA-ospf-1-area-0.0.0.0] network 10.1.1.0 0.0.0.255
```

- Configure Switch B (refer to "Configure Switch A." on page 112).
- Configure Switch C.

# Create VLANs and configure IP addresses for the VLAN interfaces. The configuration procedure is omitted.

# Configure a static route of 2.0.0.0/8.

```
<SwitchC> system-view
[SwitchC] ip route-static 2.0.0.0 8 10.4.1.2
```

# Configure OSPF for area 1.

```
[SwitchC] ospf 1 router-id 3.3.3.3
[SwitchC-ospf-1] area 1
[SwitchC-ospf-1-area-0.0.0.1] network 10.2.1.0 0.0.0.255
[SwitchC-ospf-1-area-0.0.0.1] network 10.4.1.0 0.0.0.255
[SwitchC-ospf-1-area-0.0.0.1] quit
```

# Redistribute the static route to specify Switch C as an ASBR.

```
[SwitchC-ospf-1] import-route static
[SwitchC-ospf-1] quit
```

- Configure Switch D.

# Create VLANs and configure IP addresses of the VLAN interfaces. The configuration procedure is omitted.

# Configure a static route of 1.0.0.0/8.

```
<SwitchD> system-view
[SwitchD] ip route-static 1.0.0.0 8 10.5.1.2
```

# Configure OSPF for area 2.

```
[SwitchD] ospf 1 router-id 4.4.4.4
[SwitchD-ospf-1] area 2
[SwitchD-ospf-1-area-0.0.0.2] network 10.3.1.0 0.0.0.255
[SwitchD-ospf-1-area-0.0.0.2] network 10.5.1.0 0.0.0.255
[SwitchD-ospf-1-area-0.0.0.2] quit
```

# Redistribute the static route to specify Switch D as an ASBR.

```
[SwitchD-ospf-1] import-route static
[SwitchD-ospf-1] quit
```

- *The above-mentioned steps configure non-backbone areas, backbone area, and ABRs/ASBRs.*
- *By using the **display ospf lsdb** command on Switch C, you can see that Type-3 LSAs, Type-4 LSAs, and Type-5 LSAs exist in the link state database (LSDB). You can control the generation of Type-4 LSAs, Type-5 LSAs, and Type-7 LSAs by configuring the NSSA attribute.*

NSSA area configuration 1 (area 1 is an NSSA area)

After this configuration, packets destined for an IP address (in another AS) advertised by the ASBR of the NSSA area will be forwarded by the ASBR, while packets destined for an IP address (in another AS) not advertised by the ASBR will be dropped.

Based on the configuration in "Non-backbone area and backbone area configuration (area 1 is a non-backbone area)" on page 107, perform the following steps:

# Configure area 1 as an NSSA area.

```
[SwitchA-ospf-1-area-0.0.0.1] nssa
[SwitchC-ospf-1-area-0.0.0.1] nssa
```

- *The steps above configure an NSSA area.*
- *Use the **display ospf lsdb** command on Switch C to display the LSDB. You can see that no Type-4 LSAs or Type-5 LSAs exist in the LSDB. But Type-7 LSAs are installed.*

NSSA area configuration 2 (area 1 is an NSSA area)

After this configuration, packets from the NSSA area to other ASs are forwarded by the ASBR of the NSSA area.

Based on the configuration in “Non-backbone area and backbone area configuration (area 1 is a non-backbone area)” on page 107, perform the following steps:

# Configure a default route.

```
[SwitchC] ip route-static 0.0.0.0 0.0.0.0 10.4.1.2
```

# Configure Area 1 as an NSSA area. Switch C will forward all the packets to other ASs.

```
[SwitchA-ospf-1-area-0.0.0.1] nssa
[SwitchC-ospf-1-area-0.0.0.1] nssa default-route-advertise
```

- *The steps above configure an NSSA area.*
- *Use the **display ospf lsdb** command on Switch C to display the LSDB. You can see that no Type-4 LSAs or Type-5 LSAs exist in the LSDB. But Type-7 LSAs and a Type-7 default LSA are added.*

NSSA area configuration 3 (area 1 is an NSSA area)

After this configuration, packets destined for an IP address (in another AS) advertised by the ASBR of the NSSA area will be forwarded by the ASBR, while packets destined for an IP address (in another AS) not advertised by the ASBR will be forward by the ABR of the area to the ASBR of another area for further forwarding.

Based on the configuration in “Non-backbone area and backbone area configuration (area 1 is a non-backbone area)” on page 107, perform the following steps:

# Configure area 1 as an NSSA area.

```
[SwitchA-ospf-1-area-0.0.0.1] nssa default-route-advertise
[SwitchC-ospf-1-area-0.0.0.1] nssa
```

- *The steps above configure an NSSA area.*

- *Use the **display ospf lsdb** command on Switch C to display the LSDB. You can see that no Type-4 LSAs or Type-5 LSAs exist in the LSDB. But Type-7 LSAs and a Type-7 default LSA are installed.*

Totally NSSA area configuration (area 1 is a totally NSSA area)

Based on the configuration in "Non-backbone area and backbone area configuration (area 1 is a non-backbone area)" on page 107, perform the following steps:

# Configure area 1 as a totally NSSA area.

```
[SwitchA-ospf-1-area-0.0.0.1] nssa no-summary
[SwitchC-ospf-1-area-0.0.0.1] nssa
```

- *The steps above configure a totally NSSA area.*
- *Use the **display ospf lsdb** command on Switch C to display the LSDB. You can see that no Type-3 LSAs, Type-4 LSAs, or Type-5 LSAs exist in the LSDB. But Type-7 LSAs and a default Type-3 LSA are added.*

Complete Configuration

In the following example, the ASBR of the NSSA area will forward all the packets destined for other ASs. For the configurations in other cases, refer to "Configuration Procedure" on page 112.

- Perform the following configuration on Switch A.

```
#
vlan 100
#
vlan 200
#
interface Vlan-interface100
 ip address 10.1.1.1 255.255.255.0
#
interface Vlan-interface200
 ip address 10.2.1.1 255.255.255.0
#
ospf 1 router-id 1.1.1.1
 area 0.0.0.1
  network 10.2.1.0 0.0.0.255
  nssa
 #
 area 0.0.0.0
  network 10.1.1.0 0.0.0.255
#
```

- Perform the following configuration on Switch B.

```
#
vlan 100
#
vlan 200
#
interface Vlan-interface100
 ip address 10.1.1.2 255.255.255.0
#
```

```
interface Vlan-interface200
 ip address 10.3.1.1 255.255.255.0
#
ospf 1 router-id 2.2.2.2
 area 0.0.0.2
  network 10.3.1.0 0.0.0.255
 #
 area 0.0.0.0
  network 10.1.1.0 0.0.0.255
#
```

- Perform the following configuration on Switch C.

```
#
vlan 200
#
vlan 300
#
interface Vlan-interface200
 ip address 10.2.1.2 255.255.255.0
#
interface Vlan-interface300
 ip address 10.4.1.1 255.255.255.0
#
ospf 1 router-id 3.3.3.3
 import-route static
 area 0.0.0.1
  network 10.2.1.0 0.0.0.255
  network 10.4.1.0 0.0.0.255
  nssa default-route-advertise
#
 ip route-static 0.0.0.0 0.0.0.0 10.4.1.2 preference 60
 ip route-static 2.0.0.0 255.0.0.0 10.4.1.2 preference 60
#
```

- Perform the following configuration on Switch D.

```
#
vlan 200
#
vlan 300
#
interface Vlan-interface200
 ip address 10.3.1.2 255.255.255.0
#
interface Vlan-interface300
 ip address 10.5.1.1 255.255.255.0
#
ospf 1 router-id 4.4.4.4
 import-route static
 area 0.0.0.2
  network 10.3.1.0 0.0.0.255
  network 10.5.1.0 0.0.0.255
#
 ip route-static 1.0.0.0 255.0.0.0 10.5.1.2 preference 60
#
```

Precautions

- To configure an NSSA area as a totally NSSA area, use the **stub no-summary** command on the ABR of the NSSA area.

- After you configure an area as a totally NSSA area, the ABR of the totally NSSA area will automatically generate a Type-3 default LSA into the totally NSSA area.
- For the ASBR of an NSSA area to generate a default Type-7 LSA, the default route with the destination address 0.0.0.0/0 must exist in the routing table and you need to execute the **nssa default-route-advertise** command.
- For the ABR of an NSSA area to generate a default Type-7 LSA, you only need to execute the **nssa default-route-advertise** command on it.

Configuring OSPF Route Summarization

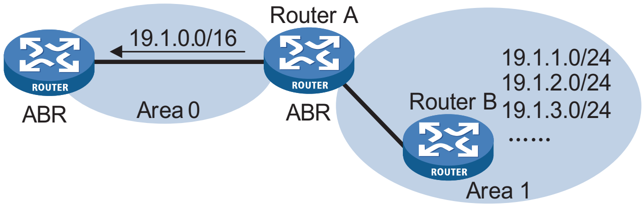
You can configure an ABR or ASBR to summarize routes with the same prefix into a single route and distribute it to other areas.

An AS is divided into different areas that are interconnected through ABRs. Through route summarization, routing information across areas and the size of routing tables on routers will be reduced, improving the calculation speed of routers.

After calculating the intra-area routes of an area, an ABR summarizes contiguous networks into one route and advertises it to other areas according to the related configuration.

For example, as shown in the following figure, in Area 1 are three intra-area routes 19.1.1.0/24, 19.1.2.0/24, and 19.1.3.0/24. By configuring route summarization on Router A, the three routes are summarized with the route 19.1.0.0/16 that is advertised into Area 0.

Figure 32 Route summarization



OSPF performs two types of route summarization:

1 ABR route summarization

To distribute routing information to other areas, an ABR generates Type-3 LSAs on a per network segment basis. If contiguous network segments are available in the area, you can summarize them with a single network segment. In this way, the ABR in the area distributes only the summary LSA to reduce the scale of LSDBs on routers in other areas.

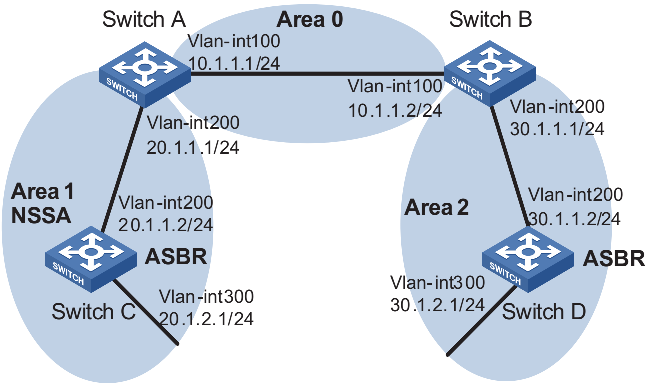
2 ASBR route summarization

If summarization for redistributed routes is configured on an ASBR, it will summarize redistributed Type-5 LSAs that fall into the specified address range. If in an NSSA area, it also summarizes Type-7 LSAs that fall into the specified address range.

If this feature is configured on the ABR of the NSSA area, the ABR will summarize Type-5 LSAs translated from Type-7 LSAs.

Network Diagram

Figure 33 Network diagram for route summarization configuration



Networking and Configuration Requirements

Network devices run OSPF to forward packets. Configure ABR and ASBR route summarization to reduce the routing information across areas and the size of routing tables on routers. Based on the actual needs, you can filter out specified routes through route summarization.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

OSPF basic configuration and area configuration

- Configure Switch A.

# Create VLANs and configure IP addresses for the VLAN interfaces. The configuration procedure is omitted.

# Configure OSPF basic functions. The configuration procedure is omitted.

# Configure the NSSA attribute of Switch A.

```
<SwitchA> system-view
[SwitchA] ospf 1
[SwitchA-ospf-1] area 1
[SwitchA-ospf-1-area-0.0.0.1] nssa
[SwitchA-ospf-1-area-0.0.0.1] quit
```

- Configure Switch C.

# Create VLANs and configure IP addresses for the VLAN interfaces. The configuration procedure is omitted.

# Configure OSPF basic functions. The configuration procedure is omitted.

# Configure the static routes 2.1.3.0/24, 2.1.4.0/24, 2.1.5.0/24, 2.1.6.0/24, and 2.1.7.0/24.

```
<SwitchC> system-view
[SwitchC] ip route-static 2.1.3.0 24 20.1.2.2
[SwitchC] ip route-static 2.1.4.0 24 20.1.2.2
[SwitchC] ip route-static 2.1.5.0 24 20.1.2.2
[SwitchC] ip route-static 2.1.6.0 24 20.1.2.2
[SwitchC] ip route-static 2.1.7.0 24 20.1.2.2
```

# Redistribute the static routes and configure the NSSA attribute of Switch C.

```
[SwitchC] ospf 1
[SwitchC-ospf-1] import-route static
[SwitchC-ospf-1] area 1
[SwitchC-ospf-1-area-0.0.0.1] nssa
[SwitchC-ospf-1-area-0.0.0.1] quit
```

- Configure Switch B.

# Create VLANs and configure IP addresses for the VLAN interfaces. The configuration procedure is omitted.

# Configure OSPF basic functions. The configuration procedure is omitted.

- Configure Switch D.

# Create VLANs and configure IP addresses for the VLAN interfaces. The configuration procedure is omitted.

# Configure OSPF basic functions. The configuration procedure is omitted.

# Configure the static routes 1.1.3.0/24, 1.1.4.0/24, 1.1.5.0/24, 1.1.6.0/24, and 1.1.7.0/24.

```
<SwitchD> system-view
[SwitchD] ip route-static 1.1.3.0 24 30.1.2.2
[SwitchD] ip route-static 1.1.4.0 24 30.1.2.2
[SwitchD] ip route-static 1.1.5.0 24 30.1.2.2
[SwitchD] ip route-static 1.1.6.0 24 30.1.2.2
[SwitchD] ip route-static 1.1.7.0 24 30.1.2.2
```

# Redistribute the static routes.

```
[SwitchD] ospf 1
[SwitchD-ospf-1] import-route static
```

ABR route summarization configuration

This configuration is applicable when an ABR needs to summarize the Type-3 LSAs of an area. The following takes the ABR route summarization configuration on Switch B as an example.

Based on "OSPF basic configuration and area configuration" on page 118, perform the following configuration:

# Configure ABR route summarization to summarize the routes 30.1.1.0/24 and 30.1.2.0/24 in area 2 into 30.1.0.0/22.

```
[SwitchB-ospf-1] area 2
[SwitchB-ospf-1-area-0.0.0.2] abr-summary 30.1.0.0 255.255.252.0
[SwitchB-ospf-1-area-0.0.0.2] quit
```

ASBR route summarization configuration 1

This configuration is applicable when an ASBR needs to summarize the Type-5 LSAs or Type-7 LSAs. The following takes the ASBR route summarization configuration on Switch D as an example.

Based on "OSPF basic configuration and area configuration" on page 118, perform the following configuration:

# Configure ASBR route summarization to summarize the routes 1.1.4.0/24, 1.1.5.0/24, 1.1.6.0/24, and 1.1.7.0/24 into 1.1.4.0/22 and to prevent 1.1.3.0/24 from being advertised to any other area.

```
[SwitchD-ospf-1] asbr-summary 1.1.4.0 255.255.252.0
[SwitchD-ospf-1] asbr-summary 1.1.3.0 255.255.255.0 not-advertise
```

ASBR route summarization configuration 2

This configuration is applicable when the ABR in an NSSA area needs to translate Type-7 LSAs into Type-5 LSAs and summarize the Type-5 LSAs.

Based on "OSPF basic configuration and area configuration" on page 118, perform the following configuration:

# Switch A is the ABR of the NSSA area. Configure ASBR route summarization to summarize the routes 2.1.4.0/24, 2.1.5.0/24, 2.1.6.0/24, and 2.1.7.0/24 into 2.1.4.0/22 and to prevent 2.1.3.0/24 from being advertised.

```
[SwitchA-ospf-1] asbr-summary 2.1.4.0 255.255.252.0
[SwitchA-ospf-1] asbr-summary 2.1.3.0 255.255.255.0 not-advertise
```

Complete Configuration

ABR route summarization configuration

Configure ABR route summarization on Switch B.

- Perform the following configuration on Switch A.

```
#
vlan 100
#
vlan 200
#
interface Vlan-interface100
 ip address 10.1.1.1 255.255.255.0
#
interface Vlan-interface200
 ip address 20.1.1.1 255.255.255.0
#
ospf 1 router-id 1.1.1.1
 area 0.0.0.1
```

```
  network 20.1.1.0 0.0.0.255
  nssa
 #
 area 0.0.0.0
  network 10.1.1.0 0.0.0.255
#
```

- Perform the following configuration on Switch B.

```
#
vlan 100
#
vlan 200
#
interface Vlan-interface100
 ip address 10.1.1.2 255.255.255.0
#
interface Vlan-interface200
 ip address 30.1.1.1 255.255.255.0
#
ospf 1 router-id 2.2.2.2
 area 0.0.0.2
  network 30.1.1.0 0.0.0.255
  abr-summary 30.1.0.0 255.255.252.0 advertise
 #
 area 0.0.0.0
  network 10.1.1.0 0.0.0.255
#
```

- Perform the following configuration on Switch C.

```
#
vlan 200
#
vlan 300
#
interface Vlan-interface200
 ip address 20.1.1.2 255.255.255.0
#
interface Vlan-interface300
 ip address 20.1.2.1 255.255.255.0
#
ospf 1 router-id 3.3.3.3
 import-route static
 area 0.0.0.2
  network 20.1.1.0 0.0.0.255
  network 20.1.2.0 0.0.0.255
  nssa
#
 ip route-static 2.1.3.0 255.255.255.0 20.1.2.2 preference 60
 ip route-static 2.1.4.0 255.255.255.0 20.1.2.2 preference 60
 ip route-static 2.1.5.0 255.255.255.0 20.1.2.2 preference 60
 ip route-static 2.1.6.0 255.255.255.0 20.1.2.2 preference 60
 ip route-static 2.1.7.0 255.255.255.0 20.1.2.2 preference 60
#
```

- Perform the following configuration on Switch D.

```
#
vlan 200
#
```

```
vlan 300
#
interface Vlan-interface200
 ip address 30.1.1.2 255.255.255.0
#
interface Vlan-interface300
 ip address 30.1.2.1 255.255.255.0
#
ospf 1 router-id 4.4.4.4
 import-route static
 area 0.0.0.2
  network 30.1.1.0 0.0.0.255
  network 30.1.2.0 0.0.0.255
#
 ip route-static 1.1.3.0 255.255.255.0 30.1.2.2 preference 60
 ip route-static 1.1.4.0 255.255.255.0 30.1.2.2 preference 60
 ip route-static 1.1.5.0 255.255.255.0 30.1.2.2 preference 60
 ip route-static 1.1.6.0 255.255.255.0 30.1.2.2 preference 60
 ip route-static 1.1.7.0 255.255.255.0 30.1.2.2 preference 60
#
```

ASBR route summarization configuration 1

Configure ASBR route summarization on Switch D.

- Configure Switch A.

```
#
vlan 100
#
vlan 200
#
interface Vlan-interface100
 ip address 10.1.1.1 255.255.255.0
#
interface Vlan-interface200
 ip address 20.1.1.1 255.255.255.0
#
ospf 1 router-id 1.1.1.1
 area 0.0.0.1
  network 20.1.1.0 0.0.0.255
  nssa
 #
 area 0.0.0.0
  network 10.1.1.0 0.0.0.255
#
```

- Configure Switch B.

```
#
vlan 100
#
vlan 200
#
interface Vlan-interface100
 ip address 10.1.1.2 255.255.255.0
#
interface Vlan-interface200
 ip address 30.1.1.1 255.255.255.0
#
```

```
ospf 1 router-id 2.2.2.2
 area 0.0.0.2
  network 30.1.1.0 0.0.0.255
 #
 area 0.0.0.0
  network 10.1.1.0 0.0.0.255
#
```

- Configure Switch C.

```
#
vlan 200
#
vlan 300
#
interface Vlan-interface200
 ip address 20.1.1.2 255.255.255.0
#
interface Vlan-interface300
 ip address 20.1.2.1 255.255.255.0
#
ospf 1 router-id 3.3.3.3
 import-route static
 area 0.0.0.2
  network 20.1.1.0 0.0.0.255
  network 20.1.2.0 0.0.0.255
  nssa
#
 ip route-static 2.1.3.0 255.255.255.0 20.1.2.2 preference 60
 ip route-static 2.1.4.0 255.255.255.0 20.1.2.2 preference 60
 ip route-static 2.1.5.0 255.255.255.0 20.1.2.2 preference 60
 ip route-static 2.1.6.0 255.255.255.0 20.1.2.2 preference 60
 ip route-static 2.1.7.0 255.255.255.0 20.1.2.2 preference 60
#
```

- Configure Switch D.

```
#
vlan 200
#
vlan 300
#
interface Vlan-interface200
 ip address 30.1.1.2 255.255.255.0
#
interface Vlan-interface300
 ip address 30.1.2.1 255.255.255.0
#
ospf 1 router-id 4.4.4.4
 asbr-summary 1.1.4.0 255.255.252.0
 asbr-summary 1.1.3.0 255.255.255.0 not-advertise
 import-route static
 area 0.0.0.2
  network 30.1.1.0 0.0.0.255
  network 30.1.2.0 0.0.0.255
#
 ip route-static 1.1.3.0 255.255.255.0 30.1.2.2 preference 60
 ip route-static 1.1.4.0 255.255.255.0 30.1.2.2 preference 60
 ip route-static 1.1.5.0 255.255.255.0 30.1.2.2 preference 60
 ip route-static 1.1.6.0 255.255.255.0 30.1.2.2 preference 60
 ip route-static 1.1.7.0 255.255.255.0 30.1.2.2 preference 60
#
```

ASBR route summarization configuration 2

Configure ASBR route summarization on Switch A to summarize the Type-5 LSAs translated from Type-7 LSAs.

- Configure Switch A.

```
#
vlan 100
#
vlan 200
#
interface Vlan-interface100
 ip address 10.1.1.1 255.255.255.0
#
interface Vlan-interface200
 ip address 20.1.1.1 255.255.255.0
#
ospf 1 router-id 1.1.1.1
 asbr-summary 2.1.4.0 255.255.252.0
 asbr-summary 2.1.3.0 255.255.255.0 not-advertise
 area 0.0.0.1
  network 20.1.1.0 0.0.0.255
  nssa
 #
 area 0.0.0.0
  network 10.1.1.0 0.0.0.255
#
```

- Configure Switch B.

```
#
vlan 100
#
vlan 200
#
interface Vlan-interface100
 ip address 10.1.1.2 255.255.255.0
#
interface Vlan-interface200
 ip address 30.1.1.1 255.255.255.0
#
ospf 1 router-id 2.2.2.2
 area 0.0.0.2
  network 30.1.1.0 0.0.0.255
 #
 area 0.0.0.0
  network 10.1.1.0 0.0.0.255
#
```

- Configure Switch C.

```
#
vlan 200
#
vlan 300
#
interface Vlan-interface200
```

```
 ip address 20.1.1.2 255.255.255.0
#
interface Vlan-interface300
 ip address 20.1.2.1 255.255.255.0
#
ospf 1 router-id 3.3.3.3
 import-route static
 area 0.0.0.2
  network 20.1.1.0 0.0.0.255
  network 20.1.2.0 0.0.0.255
  nssa
#
 ip route-static 2.1.3.0 255.255.255.0 20.1.2.2 preference 60
 ip route-static 2.1.4.0 255.255.255.0 20.1.2.2 preference 60
 ip route-static 2.1.5.0 255.255.255.0 20.1.2.2 preference 60
 ip route-static 2.1.6.0 255.255.255.0 20.1.2.2 preference 60
 ip route-static 2.1.7.0 255.255.255.0 20.1.2.2 preference 60
#
```

- Configure Switch D.

```
#
vlan 200
#
vlan 300
#
interface Vlan-interface200
 ip address 30.1.1.2 255.255.255.0
#
interface Vlan-interface300
 ip address 30.1.2.1 255.255.255.0
#
ospf 1 router-id 4.4.4.4
 import-route static
 area 0.0.0.2
  network 30.1.1.0 0.0.0.255
  network 30.1.2.0 0.0.0.255
#
 ip route-static 1.1.3.0 255.255.255.0 30.1.2.2 preference 60
 ip route-static 1.1.4.0 255.255.255.0 30.1.2.2 preference 60
 ip route-static 1.1.5.0 255.255.255.0 30.1.2.2 preference 60
 ip route-static 1.1.6.0 255.255.255.0 30.1.2.2 preference 60
 ip route-static 1.1.7.0 255.255.255.0 30.1.2.2 preference 60
#
```

Precautions

- The **abr-summary** command is applicable to the ABR only to summarize contiguous networks into a single network. You can use the **not-advertise** keyword to not advertise a specified summary route in a Type-3 LSA.
- After the **asbr-summary** command is used on an ASBR, it will summarize the Type-5 LSAs falling into the specified address range; if the ASBR is in an NSSA area, it will summarize the Type-7 LSAs within the specified address range. If used on the ABR of an NSSA area, the **asbr-summary** command summarizes Type-5 LSAs translated from Type-7 LSAs. If the router is not the ABR in the NSSA area, no summarization is performed. You can use the **not-advertise** keyword to not advertise a specified summary route in a LSA.

Configuring OSPF Virtual Link

Among OSPF areas in an AS, one area is different from any other area. Its area ID is 0 and it is usually called the backbone area. The backbone area is responsible for distributing routing information between none-backbone areas. Therefore, OSPF requires that:

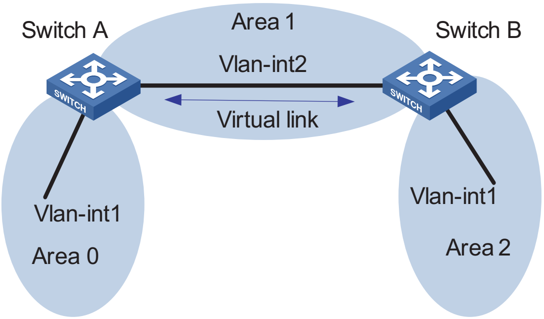
- All non-backbone areas must maintain connectivity to the backbone area.
- The backbone area must maintain connectivity within itself.

In practice, the requirements may not be satisfied due to physical limitations. In this case, configuring OSPF virtual links is a solution.

A virtual link is established between two ABRs through a non-backbone area and is configured on both ABRs to take effect. The non-backbone area is a transit area.

Network Diagram

Figure 34 Networking diagram for OSPF virtual link



Device	Interface	IP address	Router ID
Switch A	Vlan-int1	196.1.1.2/24	1.1.1.1
	Vlan-int2	197.1.1.2/24	-
Switch B	Vlan-int1	152.1.1.1/24	2.2.2.2
	Vlan-int2	197.1.1.1/24	-

Networking and Configuration Requirements

Configure OSPF in the network, which is divided into three areas: the backbone area and two non-backbone areas (Area 1 and Area 2). Area 2 has no direct connection to the backbone area; the connection from Area 2 to the backbone area must go through Area 1. The user hopes to enable Area 2 to communicate with the other two areas.

Based on the user requirements and network environment, configure a virtual link to connect Area 2 to the backbone area.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

1 Configure OSPF basic functions.

# Configure Switch A.

```
<SwitchA> system-view
[SwitchA] interface vlan-interface 1
[SwitchA-Vlan-interface1] ip address 196.1.1.2 255.255.255.0
[SwitchA-Vlan-interface1] quit
[SwitchA] interface vlan-interface 2
[SwitchA-Vlan-interface2] ip address 197.1.1.2 255.255.255.0
[SwitchA-Vlan-interface2] quit
[SwitchA] router id 1.1.1.1
[SwitchA] ospf
[SwitchA-ospf-1] area 0
[SwitchA-ospf-1-area-0.0.0.0] network 196.1.1.0 0.0.0.255
[SwitchA-ospf-1-area-0.0.0.0] quit
[SwitchA-ospf-1] area 1
[SwitchA-ospf-1-area-0.0.0.1] network 197.1.1.0 0.0.0.255
[SwitchA-ospf-1-area-0.0.0.1] quit
```

# Configure Switch B.

```
<SwitchB> system-view
[SwitchB] interface Vlan-interface 1
[SwitchB-Vlan-interface1] ip address 152.1.1.1 255.255.255.0
[SwitchB-Vlan-interface1] quit
[SwitchB] interface Vlan-interface 2
[SwitchB-Vlan-interface2] ip address 197.1.1.1 255.255.255.0
[SwitchB-Vlan-interface2] quit
[SwitchB] router id 2.2.2.2
[SwitchB] ospf
[SwitchB-ospf-1] area 1
[SwitchB-ospf-1-area-0.0.0.1] network 197.1.1.0 0.0.0.255
[SwitchB-ospf-1-area-0.0.0.1] quit
[SwitchB-ospf-1] area 2
[SwitchB-ospf-1-area-0.0.0.2] network 152.1.1.0 0.0.0.255
[SwitchB-ospf-1-area-0.0.0.2] quit
```

2 Configure a virtual link.

# Configure Switch A.

```
[SwitchA-ospf-1] area 1
[SwitchA-ospf-1-area-0.0.0.1] vlink-peer 2.2.2.2
[SwitchA-ospf-1-area-0.0.0.1] quit
[SwitchA-ospf-1] quit
```

# Configure Switch B.

```
[SwitchB-ospf-1] area 1
[SwitchB-ospf-1-area-0.0.0.1] vlink-peer 1.1.1.1
[SwitchB-ospf-1-area-0.0.0.1] quit
```

Complete Configuration

- Perform the following configuration on Switch A.

```
#
 router id 1.1.1.1
#
vlan 1
#
vlan 2
#
interface Vlan-interface1
 ip address 196.1.1.2 255.255.255.0
#
interface Vlan-interface2
 ip address 197.1.1.2 255.255.255.0
#
ospf 1
 area 0.0.0.0
  network 196.1.1.0 0.0.0.255
 area 0.0.0.1
  network 197.1.1.0 0.0.0.255
  vlink-peer 2.2.2.2
#
```

- Perform the following configuration on Switch B.

```
#
 router id 2.2.2.2
#
vlan 1
#
vlan 2
#
interface Vlan-interface1
 ip address 152.1.1.1 255.255.255.0
#
interface Vlan-interface2
 ip address 197.1.1.1 255.255.255.0
#
ospf 1
 area 0.0.0.1
  network 197.1.1.0 0.0.0.255
  vlink-peer 1.1.1.1
 area 0.0.0.2
  network 152.1.1.0 0.0.0.255
#
```

Precautions

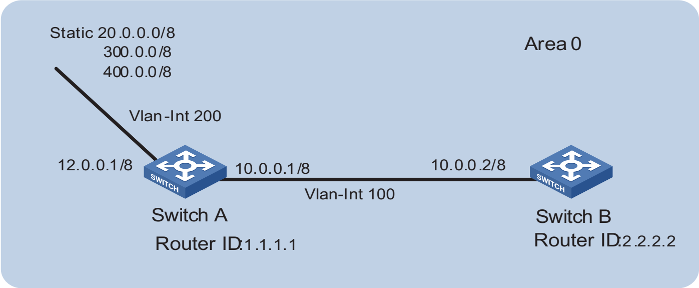
- Both ends of a virtual link must be ABRs configured with the **vlink-peer** command.
- A virtual link cannot transit the backbone area.
- The **vlink-peer** command needs to be used in the transit area.

Configuring Routing Policies

When advertising, redistributing or receiving routing information, a router can apply some policy to filter the routing information. For example, a router receives/sends only routing information that matches certain criteria, or a routing protocol redistributes from other protocols only the routes matching certain criteria and modifies some attributes of these routes to satisfy its needs.

Network Diagram

Figure 35 Network diagram for routing policy configuration



Networking and Configuration Requirements

- As shown in the figure above, Switch A and Switch B run OSPF. The router ID of Switch A is 1.1.1.1 and that of Switch B is 2.2.2.2.
- Configure three static routes and enable OSPF on Switch A.
- Apply a routing policy on Switch A when redistributing the three static routes so that the routes 20.0.0.0 and 40.0.0.0 are redistributed, and the route 30.0.0.0 is filtered out.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

Filter routing information with the import-route command and the route-policy command (method 1)

- Configure Switch A.

# Configure the IP addresses of the interfaces.

```
<SwitchA> system-view
[SwitchA] interface vlan-interface 100
[SwitchA-Vlan-interface100] ip address 10.0.0.1 255.0.0.0
[SwitchA-Vlan-interface100] quit
[SwitchA] interface vlan-interface 200
[SwitchA-Vlan-interface200] ip address 12.0.0.1 255.0.0.0
[SwitchA-Vlan-interface200] quit
```

# Configure three static routes.

```
[SwitchA] ip route-static 20.0.0.0 255.0.0.0 12.0.0.2
[SwitchA] ip route-static 30.0.0.0 255.0.0.0 12.0.0.2
[SwitchA] ip route-static 40.0.0.0 255.0.0.0 12.0.0.2
```

# Enable OSPF and specify VLAN-interface 10 to belong to area 0.

```
[SwitchA] router id 1.1.1.1
[SwitchA] ospf
[SwitchA-ospf-1] area 0
[SwitchA-ospf-1-area-0.0.0.0] network 10.0.0.0 0.255.255.255
[SwitchA-ospf-1-area-0.0.0.0] quit
[SwitchA-ospf-1]quit
```

# Configure an ACL.

```
[SwitchA] acl number 2000
[SwitchA-acl-basic-2000] rule deny source 30.0.0.0 0.255.255.255
[SwitchA-acl-basic-2000] rule permit source any
[SwitchA-acl-basic-2000] quit
```

# Configure a routing policy.

```
[SwitchA] route-policy ospf permit node 10
[SwitchA-route-policy] if-match acl 2000
[SwitchA-route-policy] quit
```

# Apply the routing policy when the static routes are redistributed.

```
[SwitchA] ospf
[SwitchA-ospf-1] import-route static route-policy ospf
```

- Configure Switch B.

# Configure the IP address of the interface.

```
<SwitchB> system-view
[SwitchB] interface vlan-interface 100
[SwitchB-Vlan-interface100] ip address 10.0.0.2 255.0.0.0
[SwitchB-Vlan-interface100] quit
```

# Enable OSPF and specify VLAN interface 100 to belong to area 0.

```
[SwitchB] router id 2.2.2.2
[SwitchB] ospf
[SwitchB-ospf-1] area 0
[SwitchB-ospf-1-area-0.0.0.0] network 10.0.0.0 0.255.255.255
[SwitchB-ospf-1-area-0.0.0.0] quit
[SwitchB-ospf-1] quit
```

Filter routing information with the import-route command and the filter-policy export command (method 2)

- Configure Switch A.

# Configure the IP addresses of the interfaces.

```
<SwitchA> system-view
[SwitchA] interface vlan-interface 100
[SwitchA-Vlan-interface100] ip address 10.0.0.1 255.0.0.0
[SwitchA-Vlan-interface100] quit
[SwitchA] interface vlan-interface 200
[SwitchA-Vlan-interface200] ip address 12.0.0.1 255.0.0.0
[SwitchA-Vlan-interface200] quit
```

# Configure three static routes.

```
[SwitchA] ip route-static 20.0.0.0 255.0.0.0 12.0.0.2
[SwitchA] ip route-static 30.0.0.0 255.0.0.0 12.0.0.2
[SwitchA] ip route-static 40.0.0.0 255.0.0.0 12.0.0.2
```

# Enable OSPF and specify VLAN interface 100 to belong to area 0.

```
[SwitchA] router id 1.1.1.1
[SwitchA] ospf
[SwitchA-ospf-1] area 0
[SwitchA-ospf-1-area-0.0.0.0] network 10.0.0.0 0.255.255.255
[SwitchA-ospf-1-area-0.0.0.0] quit
[SwitchA-ospf-1] quit
```

# Configure an ACL.

```
[SwitchA] acl number 2000
[SwitchA-acl-basic-2000] rule deny source 30.0.0.0 0.255.255.255
[SwitchA-acl-basic-2000] rule permit source any
[SwitchA-acl-basic-2000] quit
```

# Apply ACL 2000 to filter the advertised routes.

```
[SwitchA] ospf
[SwitchA-ospf-1] filter-policy 2000 export
```

# Redistribute static routes.

```
[SwitchA-ospf-1] import-route static
```

- Configure Switch B.

The configuration on Switch B is the same as that in method 1. Refer to “Configure Switch B.” on page 130.

Filter routing information with the import-route command and the asbr-summary not-advertise command (method 3)

- Configure Switch A.

# Configure the IP addresses of the interfaces.

```
<SwitchA> system-view
[SwitchA] interface vlan-interface 100
[SwitchA-Vlan-interface100] ip address 10.0.0.1 255.0.0.0
[SwitchA-Vlan-interface100] quit
[SwitchA] interface vlan-interface 200
[SwitchA-Vlan-interface200] ip address 12.0.0.1 255.0.0.0
[SwitchA-Vlan-interface200] quit
```

# Configure three static routes.

```
[SwitchA] ip route-static 20.0.0.0 255.0.0.0 12.0.0.2
[SwitchA] ip route-static 30.0.0.0 255.0.0.0 12.0.0.2
[SwitchA] ip route-static 40.0.0.0 255.0.0.0 12.0.0.2
```

# Enable OSPF and specify VLAN interface 100 to belong to area 0.

```
[SwitchA] router id 1.1.1.1
[SwitchA] ospf
[SwitchA-ospf-1] area 0
[SwitchA-ospf-1-area-0.0.0.0] network 10.0.0.0 0.255.255.255
[SwitchA-ospf-1-area-0.0.0.0] quit
```

# Configure route summarization to prevent network 30.0.0.0/8 from being advertised.

```
[SwitchA-ospf-1] asbr-summary 30.0.0.0 255.0.0.0 not-advertise
```

# Redistribute the static routes.

```
[SwitchA-ospf-1] import-route static
```

- Configure Switch B.

The configuration on Switch B is the same as that in method 1. Refer to "Configure Switch B." on page 130.

Complete Configuration

In the following complete configuration, the **import-route** command and the **route-policy** command are used to filter routing information (method 1). For the complete configurations of other methods, refer to the related configuration procedures.

- Perform the following configuration on Switch A.

```
#
 router id 1.1.1.1
#
acl number 2000
 rule 0 deny source 30.0.0.0 0.255.255.255
 rule 1 permit
#
vlan 100
#
vlan 200
#
interface Vlan-interface100
 ip address 10.0.0.1 255.0.0.0
#
interface Vlan-interface200
 ip address 12.0.0.1 255.0.0.0
#
ospf 1
 import-route static route-policy ospf
 area 0.0.0.0
  network 10.0.0.0 0.255.255.255
#
route-policy ospf permit node 10
 if-match acl 2000
#
 ip route-static 20.0.0.0 255.0.0.0 12.0.0.2 preference 60
 ip route-static 30.0.0.0 255.0.0.0 12.0.0.2 preference 60
 ip route-static 40.0.0.0 255.0.0.0 12.0.0.2 preference 60
#
```

- Perform the following configuration on Switch B.

```
#
 router id 2.2.2.2
#
vlan 100
#
interface Vlan-interface100
```

```
 ip address 10.0.0.2 255.0.0.0
#
ospf 1
 area 0.0.0.0
  network 10.0.0.0 0.255.255.255
#
```

Precautions

In an OSPF network, when an ASBR redistributes routes, you can use the command combination of **filter-policy export** and **import-route**, **route-policy** and **import-route**, or **import-route** and **asbr-summary not-advertise** to filter redistributed routing information based on the actual conditions.

The **filter-policy export** command and the **import-route** command are often used together on an ASBR to filter redistributed routes.

16 MULTICAST CONFIGURATION GUIDE

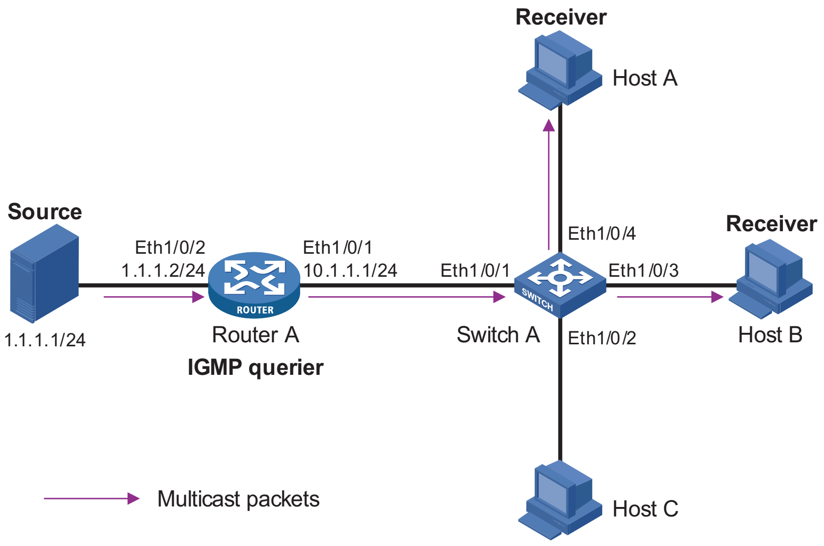
Configuring IGMP Snooping

Internet Group Management Protocol Snooping (IGMP Snooping) is a multicast constraint mechanism that runs on Layer 2 Ethernet switches to manage and control multicast groups.

By listening to and analyzing IGMP messages, a Layer 2 device running IGMP Snooping establishes and maintains mappings between ports and multicast groups and forwards multicast data based on these mappings.

Network Diagram

Figure 36 Network diagram for IGMP Snooping



Networking and Configuration Requirements

To prevent multicast packets from being flooded at Layer 2, IGMP Snooping is required on the switch.

- As shown in Figure 36, Router A connects to a multicast source (Source) through Ethernet 1/0/2, and to Switch A through Ethernet 1/0/1.
- Run PIM DM and IGMP on Router A. Enable IGMP Snooping on Switch A. Router A is the IGMP querier.
- The source sends multicast data to multicast group 224.1.1.1. Host A and Host B join multicast group 224.1.1.1.

Application Product Matrix

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions

Product series	Software version	Hardware version
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

Configuring IP addresses for the interfaces of each device

Configure the IP address and subnet mask for each interface as per Figure 36. The detailed configuration steps are omitted here.

Configuring Router A

# Enable IP multicast routing, enable PIM-DM on each interface, and enable IGMP on Ethernet 1/0/1.

```
<RouterA> system-view
[RouterA] multicast routing-enable
[RouterA] interface Ethernet 1/0/1
[RouterA-Ethernet1/0/1] igmp enable
[RouterA-Ethernet1/0/1] pim dm
[RouterA-Ethernet1/0/1] quit
[RouterA] interface Ethernet 1/0/2
[RouterA-Ethernet1/0/2] pim dm
[RouterA-Ethernet1/0/2] quit
```

Configuring Switch A

# Enable IGMP Snooping globally.

```
<SwitchA> system-view
[SwitchA] igmp-snooping enable
  Enable IGMP-Snooping ok.
```

# Create VLAN 100, assign Ethernet 1/0/1 through Ethernet 1/0/4 to VLAN 100, and enable IGMP Snooping in this VLAN.

```
[SwitchA] vlan 100
[SwitchA-vlan100] port Ethernet 1/0/1 to Ethernet 1/0/4
[SwitchA-vlan100] igmp-snooping enable
[SwitchA-vlan100] quit
```

Verifying the configuration

# View the multicast groups in VLAN 100 on Switch A.

```
<SwitchA> display igmp-snooping group vlan100
  Total 1 IP Group(s).
  Total 1 MAC Group(s).

  Vlan(id):100.
    Total 1 IP Group(s).
    Total 1 MAC Group(s).
        Router port(s):
                     Ethernet1/0/1
    IP group(s):the following ip group(s) match to one mac group.
        IP group address: 224.1.1.1
        Host port(s):
                     Ethernet1/0/3          Ethernet1/0/4
    MAC group(s):
        MAC group address: 0100-5e01-0101
        Host port(s): Ethernet1/0/3          Ethernet1/0/4
```

As shown above, a multicast group entry for 224.1.1.1 has been created on Switch A, with Ethernet 1/0/1 as the router port and Ethernet 1/0/3 and Ethernet 1/0/4 as dynamic member ports. This means that Host A and Host B have joined the multicast group 224.1.1.1.

Complete Configuration

Configuration on Switch A

```
#
 igmp-snooping enable
#
vlan 100
 igmp-snooping enable
#
interface Ethernet1/0/1
 port access vlan 100
#
interface Ethernet1/0/2
 port access vlan 100
#
interface Ethernet1/0/3
 port access vlan 100
#
interface Ethernet1/0/4
 port access vlan 100
#
```

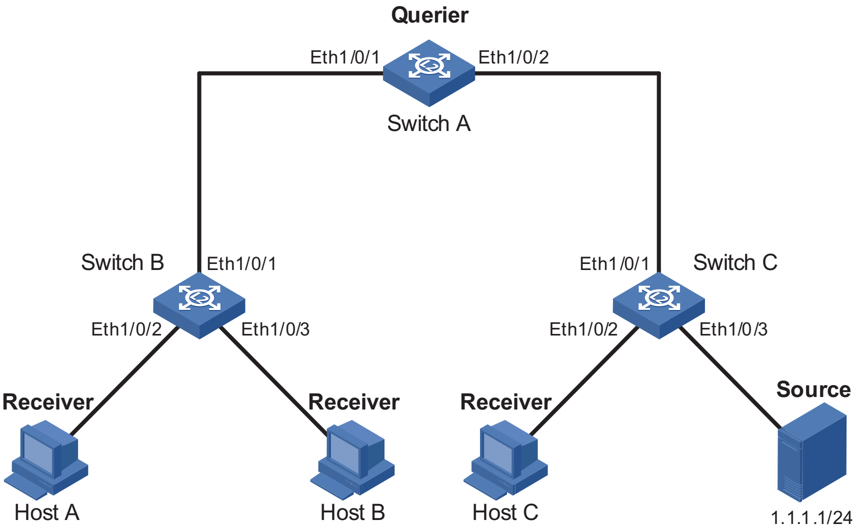
Precautions

- Layer 2 and Layer 3 multicast protocols can run on the same switch. However, a Layer 2 multicast protocol cannot run in a VLAN while a Layer 3 multicast protocol is running on the corresponding VLAN interface, and vice versa.
- Before enabling IGMP Snooping in a VLAN, be sure to enable IGMP Snooping in system view; otherwise the configuration will not succeed.

Configuring IGMP Snooping Only

Network Diagram

Figure 37 Network diagram for IGMP Snooping only configuration



Networking and Configuration Requirements

Where it is unnecessary or infeasible to build a Layer 3 multicast network, enabling IGMP Snooping on all the devices in the Layer 2 network can implement some multicast functions.

1 As shown in Figure 37, in a Layer 2 only network, Switch C connects to the multicast source through Ethernet 1/0/3. At least one receiver is attached to Switch B and Switch C respectively.

2 Enable IGMP Snooping on Switch A, Switch B, and Switch C. Switch A acts as the IGMP Snooping querier.

3 Enable Switch A and Switch B to drop unknown multicast traffic so that multicast traffic for unknown multicast groups are not flooded in the VLAN.

Application Product Matrix

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

Configuring Switch A

# Enable IGMP Snooping globally.

```
<SwitchA> system-view
[SwitchA] igmp-snooping enable
Enable IGMP-Snooping ok.
```

# Create VLAN 100, assign Ethernet 1/0/1 through Ethernet 1/0/2 to VLAN 100, and enable IGMP Snooping in this VLAN.

```
[SwitchA] vlan 100
[SwitchA-vlan100] port Ethernet 1/0/1 Ethernet 1/0/2
[SwitchA-vlan100] igmp-snooping enable
```

# Enable IGMP Snooping querier in VLAN 100.

```
[SwitchA-vlan100] igmp-snooping querier
[SwitchA-vlan100] quit
```

# Enable dropping unknown multicast packets.

```
[SwitchA] unknown-multicast drop enable
```

Configuring Switch B

# Enable IGMP Snooping globally.

```
<SwitchB> system-view
[SwitchB] igmp-snooping enable
Enable IGMP-Snooping ok.
```

# Create VLAN 100, assign Ethernet 1/0/1 through Ethernet 1/0/3 to VLAN 100, and enable IGMP Snooping in this VLAN.

```
[SwitchB] vlan 100
[SwitchB-vlan100] port Ethernet 1/0/1 to Ethernet 1/0/3
[SwitchB-vlan100] igmp-snooping enable
[SwitchB-vlan100] quit
```

# Enable dropping unknown multicast packets.

```
[SwitchB] unknown-multicast drop enable
```

Configuring Switch C

# Enable IGMP Snooping globally.

```
<SwitchC system-view
[SwitchC] igmp-snooping enable
Enable IGMP-Snooping ok.
```

# Create VLAN 100, assign Ethernet 1/0/1 through Ethernet 1/0/3 to VLAN 100, and enable IGMP Snooping in this VLAN.

```
[SwitchC] vlan 100
[SwitchC-vlan100] port Ethernet 1/0/1 to Ethernet 1/0/3
[SwitchC-vlan100] igmp-snooping enable
```

⚠ ***CAUTION:*** *As Switch C is not the IGMP Snooping querier, it cannot create forwarding entries for Host A and Host B, and therefore, do not enable the function of dropping unknown multicast packets on Switch C. To avoid impact on the network and on Switch C caused by multicast flooding, it is recommended to enable IGMP Snooping querier on the switch to which the multicast source is directly attached.*

Verifying the configuration

Check the reception of multicast stream for multicast group 224.1.1.1 on Host A, and take the following steps to verify the configurations made on the switches.

1 View the information on Switch B

# View the IGMP packet statistics on Switch B.

```
<SwitchB> display igmp-snooping statistics
  Received IGMP general query packet(s) number:16.
  Received IGMP specific query packet(s) number:3.
  Received IGMP V1 report packet(s) number:0.
  Received IGMP V2 report packet(s) number:53.
  Received IGMP leave packet(s) number:1.
  Received error IGMP packet(s) number:0.
  Sent IGMP specific query packet(s) number:1.
```

Switch B has received IGMP general queries from the querier and IGMP reports from receivers.

# View the multicast group information on Switch B.

```
<Switch B> display igmp-snooping group
  Total 1 IP Group(s).
  Total 1 MAC Group(s).

  Vlan(id):100.
    Total 1 IP Group(s).
    Total 1 MAC Group(s).
    Router port(s):Ethernet1/0/1
    IP group(s):the following ip group(s) match to one mac group.
        IP group address:224.1.1.1
        Host port(s):Ethernet1/0/2
    MAC group(s):
        MAC group address:0100-5e7f-fffe
        Host port(s):Ethernet1/0/2
```

As shown above, a multicast group entry for the multicast group 224.1.1.1 has been created on Switch A, with Ethernet 1/0/1 as the router port and Ethernet 1/0/2 as the member port.

2 View the information on Switch A

# View the IGMP packet statistics on Switch A.

```
<SwitchA> display igmp-snooping statistics
  Received IGMP general query packet(s) number:0.
  Received IGMP specific query packet(s) number:0.
  Received IGMP V1 report packet(s) number:0.
  Received IGMP V2 report packet(s) number:53.
  Received IGMP leave packet(s) number:1.
  Received error IGMP packet(s) number:0.
  Sent IGMP specific query packet(s) number:1.
```

Switch A receives IGMP reports from the receivers.

# View the multicast group information on Switch A.

```
<Switch A> display igmp-snooping group
  Total 1 IP Group(s).
  Total 1 MAC Group(s).

  Vlan(id):100.
    Total 1 IP Group(s).
    Total 1 MAC Group(s).
    Router port(s):
    IP group(s):the following ip group(s) match to one mac group.
        IP group address:224.1.1.1
        Host port(s):Ethernet1/0/1
    MAC group(s):
        MAC group address:0100-5e7f-fffe
        Host port(s):Ethernet1/0/1
```

As shown above, a multicast group entry for the multicast group 224.1.1.1 has been created on Switch A, with Ethernet 1/0/1 as the member port. Acting as the IGMP Snooping querier, Switch A does not have a router port.

3 View the information on Switch C

# View the IGMP packet statistics on Switch C.

```
<SwitchC> display igmp-snooping statistics
  Received IGMP general query packet(s) number:10.
  Received IGMP specific query packet(s) number:0.
  Received IGMP V1 report packet(s) number:0.
  Received IGMP V2 report packet(s) number:0.
  Received IGMP leave packet(s) number:.0
  Received error IGMP packet(s) number:0.
  Sent IGMP specific query packet(s) number:0.
```

Switch C received only IGMP general queries from the querier.

# View the multicast group information on Switch C.

```
<Switch C> display igmp-snooping group
  Total 0 IP Group(s).
  Total 0 MAC Group(s).

Vlan(id):100.
    Total 0 IP Group(s).
    Total 0 MAC Group(s).
    Router port(s):Ethernet1/0/1
```

As shown above, no multicast entries have been created on Switch C. The switch must flood multicast data in the VLAN to allow the multicast data to flow to the receivers downstream. Therefore, do not enable the function of dropping unknown multicast packets on Switch C.

Complete Configuration

Configuration on Switch A

```
#
unknown-multicast drop enable
#
igmp-snooping enable
#
```

```
vlan 100
 igmp-snooping enable
 igmp-snooping querier
#
interface Ethernet1/0/1
 port access vlan 100
#
interface Ethernet1/0/2
 port access vlan 100
#
```

Configuration on Switch B

```
#
unknown-multicast drop enable
#
igmp-snooping enable
#
vlan 100
 igmp-snooping enable
#
interface Ethernet1/0/1
 port access vlan 100
#
interface Ethernet1/0/2
 port access vlan 100
#
interface Ethernet1/0/3
 port access vlan 100
#
```

Configuration on Switch C

```
#
igmp-snooping enable
#
vlan 100
 igmp-snooping enable
#
interface Ethernet1/0/1
 port access vlan 100
#
interface Ethernet1/0/2
 port access vlan 100
#
interface Ethernet1/0/3
 port access vlan 100
#
```

Configuring Multicast VLAN

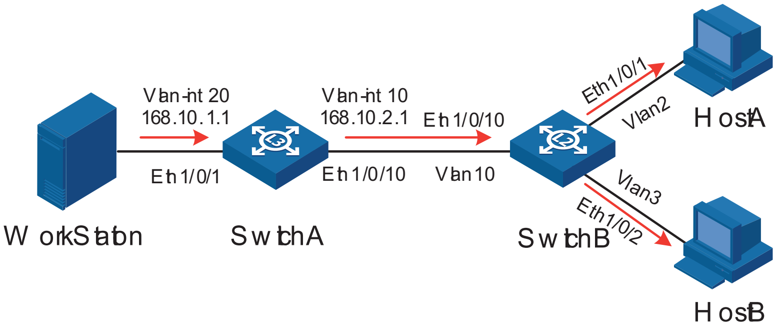
In the traditional multicast-on-demand mode, when users in different VLANs on a Layer 2 device need multicast information, the multicast router needs to forward a separate copy of the multicast data to each of these VLANs. This mode wastes a great deal of bandwidth.

With the multicast VLAN feature, you can configure a VLAN as the multicast VLAN, which can be used to transmit multicast traffic to users in different VLANs.

Since multicast packets are transmitted within the multicast VLAN, which is isolated from user VLANs, the bandwidth and security can be guaranteed.

Network Diagram

Figure 38 Network diagram for multicast VLAN



Networking and Configuration Requirements

Configure the multicast VLAN feature so that Switch A just sends multicast data to VLAN 10 rather than to each VLAN when Host A and Host B attached to Switch B need the multicast data.

The following table describes the device details:

Device	Description	Remarks
Switch A	Layer 3 switch	IP address of VLAN-interface 20 is 168.10.1.1. Ethernet 1/0/1 belongs to VLAN 20 and is connected with the workstation. IP address of VLAN-interface 10 is 168.10.2.1. Ethernet 1/0/10 belongs to VLAN 10 and is connected with Switch B.
Switch B	Layer 2 switch	VLAN 2 contains Ethernet 1/0/1 and VLAN 3 contains Ethernet 1/0/2. These two ports are connected with Host A and Host B respectively. The default VLAN of Ethernet 1/0/1 is VLAN 2 and the default VLAN of Ethernet 1/0/2 is VLAN 3. VLAN 10 contains Ethernet 1/0/10, Ethernet 1/0/1 and Ethernet 1/0/2. Ethernet 1/0/10 is connected with Switch A. VLAN 10 is multicast VLAN. Ethernet 1/0/1 sends packets of VLAN 2 and VLAN 10 without VLAN tags. Ethernet 1/0/2 sends packets of VLAN 3 and VLAN 10 without VLAN tags.
HostA	User 1	Connected with Ethernet 1/0/1 of Switch B
HostB	User 2	Connected with Ethernet 1/0/2 of Switch B

Configure VLAN 10 as a multicast VLAN so that users in VLAN 2 and VLAN 3 can receive multicast packets through VLAN 10.

Application Product Matrix

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Product series	Software version	Hardware version
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

Assume that the IP addresses have been configured and the devices have been connected correctly.

1 Configure Switch A.

# Configure the IP address of VLAN-interface 20 as 168.10.1.1, and enable PIM-DM.

```
<SwitchA> system-view
[SwitchA] multicast routing-enable
[SwitchA] vlan 20
[SwitchA-vlan20]port Ethernet1/0/1
[SwitchA-vlan20] quit
[SwitchA] interface Vlan-interface 20
[SwitchA-Vlan-interface20] ip address 168.10.1.1 255.255.255.0
[SwitchA-Vlan-interface20] pim dm
[SwitchA-Vlan-interface20] quit
```

# Create VLAN 10.

```
[SwitchA] vlan 10
[SwitchA-vlan10] quit
```

# Configure Ethernet 1/0/10 as a Hybrid port, assign it to VLAN 10, and configure it to send packets of VLAN 10 with the VLAN tag kept.

```
[SwitchA] interface Ethernet1/0/10
[SwitchA-Ethernet1/0/10] port link-type hybrid
[SwitchA-Ethernet1/0/10] port hybrid vlan 10 tagged
[SwitchA-Ethernet1/0/10] quit
```

# Configure the IP address of VLAN-interface 10 as 168.10.2.1, and enable PIM-DM and IGMP.

```
[SwitchA] interface Vlan-interface 10
[SwitchA-Vlan-interface10] ip address 168.10.2.1 255.255.255.0
[SwitchA-Vlan-interface10] igmp enable
[SwitchA-Vlan-interface10] pim dm
```

2 Configure Switch B.

# Enable IGMP Snooping globally.

```
<SwitchB> system-view
[SwitchB] igmp-snooping enable
```

# Create VLAN 2, VLAN 3, and VLAN 10, configure VLAN 10 as a multicast VLAN, and enable IGMP Snooping in VLAN 10.

```
[SwitchB] vlan 2 to 3
Please wait.... Done.
[SwitchB] vlan 10
[SwitchB-vlan10] service-type multicast
```

```
[SwitchB-vlan10] igmp-snooping enable
[SwitchB-vlan10] quit
```

# Configure Ethernet 1/0/10 as a Hybrid port, assign it to VLAN 2, VLAN 3 and VLAN 10, and configure it to send packets of VLAN 2, VLAN 3, and VLAN 10 with the respective VLAN tags kept.

```
[SwitchB] interface Ethernet1/0/10
[SwitchB-Ethernet1/0/10] port link-type hybrid
[SwitchB-Ethernet1/0/10] port hybrid vlan 2 3 10 tagged
[SwitchB-Ethernet1/0/10] quit
```

# Configure Ethernet 1/0/1 as a Hybrid port, assign it to VLAN 2 and VLAN 10, and configure it to send packets of VLAN 2 and VLAN 10 without VLAN tags. Configure VLAN 2 as the default VLAN.

```
[SwitchB] interface Ethernet1/0/1
[SwitchB-Ethernet1/0/1] port link-type hybrid
[SwitchB-Ethernet1/0/1] port hybrid vlan 2 10 untagged
[SwitchB-Ethernet1/0/1] port hybrid pvid vlan 2
[SwitchB-Ethernet1/0/1] quit
```

# Configure Ethernet 1/0/2 as a Hybrid port, assign it to VLAN 3 and VLAN 10, and configure it to send packets of VLAN 3 and VLAN 10 without VLAN tags. Configure VLAN 3 as the default VLAN.

```
[SwitchB] interface Ethernet1/0/2
[SwitchB-Ethernet1/0/2] port link-type hybrid
[SwitchB-Ethernet1/0/2] port hybrid vlan 3 10 untagged
[SwitchB-Ethernet1/0/2] port hybrid pvid vlan 3
[SwitchB-Ethernet1/0/2] quit
```

Complete Configuration

Configuration on Switch A

```
#
 multicast routing-enable
#
interface Vlan-interface10
 ip address 168.10.2.1 255.255.255.0
 igmp enable
 pim dm
#
interface Vlan-interface20
 ip address 168.10.1.1 255.255.255.0
 pim dm
#
interface Ethernet1/0/1
 port access vlan 20
#
interface Ethernet1/0/10
 port link-type hybrid
 port hybrid vlan 10 tagged
#
```

Configuration on Switch B

```
#
 igmp-snooping enable
```

```
#
vlan 1 to 3
#
vlan 10
 service-type multicast
 igmp-snooping enable
#
interface Ethernet1/0/1
 port link-type hybrid
 port hybrid vlan 1 to 2 10 untagged
 port hybrid pvid vlan 2
#
interface Ethernet1/0/2
 port link-type hybrid
 port hybrid vlan 1 3 10 untagged
 port hybrid pvid vlan 3
#
interface Ethernet1/0/10
 port link-type hybrid
 port hybrid vlan 2 to 3 10 tagged
 port hybrid vlan 1 untagged
```

Precautions

- A port belongs to one multicast VLAN only.
- Only Hybrid ports can be connected with receivers.
- Upon receiving a multicast packet, a router port forwards the packet only to the member ports in the same VLAN. Therefore, the member ports must belong to the same multicast VLAN with the router port.
- When assigning a router port to a multicast VLAN, be sure to configure it as a trunk port, or a hybrid port that sends packets of the multicast VLAN with the VLAN tag kept; otherwise all the member ports in this multicast VLAN will be unable to receive multicast packets.

Configuring PIM-SM plus IGMP plus IGMP Snooping

PIM-SM is a type of sparse mode multicast protocol. It uses the “pull mode” for multicast forwarding, and is suitable for large- and medium-sized networks with sparsely and widely distributed multicast group members.

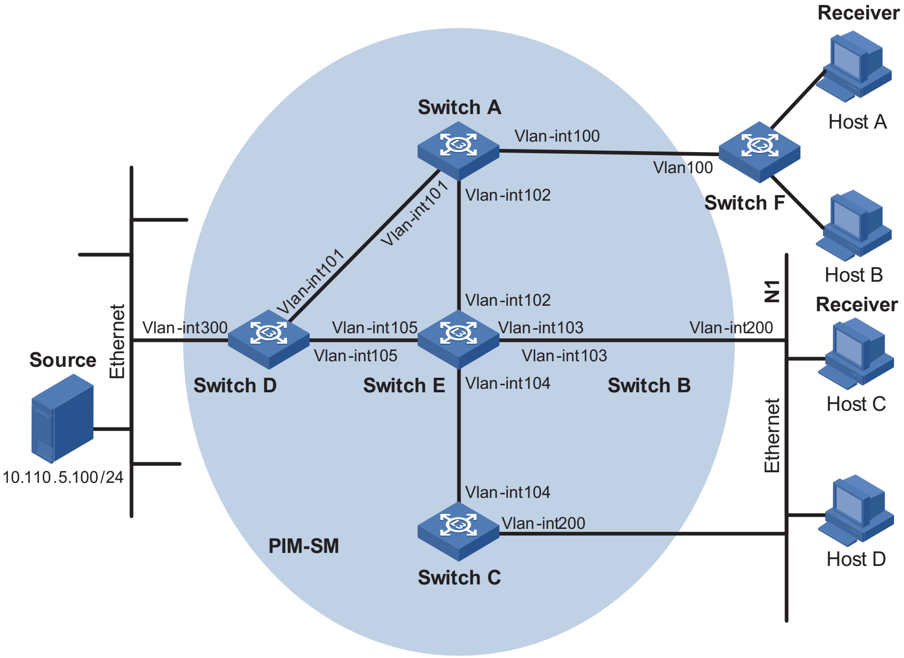
The basic implementation of PIM-SM is as follows:

- PIM-SM assumes that hosts need multicast data only if they explicitly express their interest in the data. PIM-SM builds and maintains rendezvous point trees (RPT) for multicast traffic delivery. An RPT is rooted at a router in the PIM domain as the common node referred to as rendezvous point (RP), through which the multicast data travels along the RPT and reaches the receivers.
- When a receiver is interested in the multicast data addressed to a specific multicast group, the last-hop router sends a join message to the RP corresponding to that multicast group. The path along which the message goes hop by hop to the RP forms a branch of the RPT.
- When a multicast source sends multicast traffic to a multicast group, the first-hop router encapsulates the first packet in a register message, and sends the message to the corresponding RP by unicast. The arrival of this message at the RP triggers the establishment of an SPT rooted at the multicast source.

Then, the multicast source sends the multicast traffic along the SPT to the RP. Upon reaching the RP, the multicast traffic flows down the RPT to the receivers.

Network Diagram

Figure 39 Network diagram for PIM-SM, IGMP, and IGMP Snooping configuration



Device	Interface	IP address	Ports
Switch A	Vlan-int100	10.110.1.1/24	Ethernet1/0/1
	Vlan-int101	192.168.1.1/24	Ethernet1/0/2
	Vlan-int102	192.168.9.1/24	Ethernet1/0/3
Switch B	Vlan-int200	10.110.2.1/24	Ethernet1/0/1
	Vlan-int103	192.168.2.1/24	Ethernet1/0/2
Switch C	Vlan-int200	10.110.2.2/24	Ethernet1/0/1
	Vlan-int104	192.168.3.1/24	Ethernet1/0/2
Switch D	Vlanint300	10.110.5.1/24	Ethernet1/0/1
	Vlanint101	192.168.1.2/24	Ethernet1/0/2
	Vlanint105	192.168.4.2/24	Ethernet1/0/3
Switch E	Vlanint104	192.168.3.2/24	Ethernet1/0/3
	Vlanint103	192.168.2.2/24	Ethernet1/0/2
	Vlanint102	192.168.9.2/24	Ethernet1/0/1
	Vlanint105	192.168.4.1/24	Ethernet1/0/4
Switch F	Vlan100	-	Ethernet1/0/1, Ethernet1/0/2, Ethernet1/0/3

Networking and Configuration Requirements

Requirement Analysis

When users receive VOD information through multicast, the information receiving mode may vary depending on user requirements:

1. To avoid flooding of the video information at Layer 2, IGMP Snooping needs to be enabled on Switch E, through which Host A and Host B receive the multicast data.
2. To ensure reliable and stable reception of multicast data, Switch B and Switch C provide link backup for the directly attached stub network N1, which comprises multicast receivers Host C and Host D.
3. The PIM-SM domain as a single-BSR domain, and OSPF runs in the domain for unicast routing.

Configuration Plan

1. Switch D connects to the network that comprises the multicast source (Source) through VLAN-interface 300.
2. Switch A connects to Switch F through VLAN-interface 100, and to Switch D and Switch E through VLAN-interface 101 and VLAN-interface 102 respectively.
3. Switch B and Switch C connect to stub network N1 through their respective VLAN-interface 200, and to Switch E through VLAN-interface 103 and VLAN-interface 104 respectively.
4. Both VLAN-interface 105 of Switch D and VLAN-interface 102 of Switch E serve as C-BSRs and C-RPs.
5. Enable IGMPv2 on VLAN-interface 100 of Switch A. On Switch F, enable IGMP Snooping globally and in VLAN 100. Run IGMPv2 on Switch B and Switch C for group management on stub network N1. Typically, Switch B acts as the querier because its interface on the multi-access subnet has a lower IP address.

Application Product Matrix

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions

Configuration Procedure

Configuring the interface IP addresses and unicast routing protocol for each switch

Configure the IP address and subnet mask for each interface as per Figure 39. The detailed configuration steps are omitted here.

Configure OSPF for interoperation among the switches in the PIM-SM domain. Ensure the network-layer interoperation among Switch A, Switch B, Switch C, Switch D and Switch E in the PIM-SM domain and enable dynamic update of routing information among the switches through a unicast routing protocol. The specific configuration steps are omitted here.

Configuring multicast protocols

# Enable IP multicast routing on Switch A, enable PIM-SM on each interface, and run IGMPv2 on VLAN-interface 100.

```
<SwitchA> system-view
[SwitchA] multicast routing-enable
[SwitchA] interface Vlan-interface 100
```

```
[SwitchA-Vlan-interface100] igmp enable
[SwitchA-Vlan-interface100] pim sm
[SwitchA-Vlan-interface100] quit
[SwitchA] interface vlan-interface 101
[SwitchA-Vlan-interface101] pim sm
[SwitchA-Vlan-interface101] quit
[SwitchA] interface vlan-interface 102
[SwitchA-Vlan-interface102] pim sm
```

It is necessary to enable IGMP only on interfaces with multicast receivers attached. The default IGMP version is IGMPv2.

The configuration on Switch B and Switch C is similar to that on Switch A. The configuration on Switch D and Switch E is also similar to that on Switch A except that it is not necessary to enable IGMP on the corresponding interfaces on these two switches.

# Configure the group range to be advertised in C-RP-Adv messages and configure a C-BSR and a C-RP on VLAN-interface 105 of Switch D.

```
<SwitchD> system-view
[SwitchD] acl number 2005
[SwitchD-acl-basic-2005] rule permit source 225.1.1.0 0.0.0.255
[SwitchD-acl-basic-2005] quit
[SwitchD] pim
[SwitchD-pim] c-bsr vlan-interface 105 24 2
[SwitchD-pim] c-rp vlan-interface 105 group-policy 2005 priority 2
[SwitchD-pim] quit
```

# Configure the group range to be advertised in C-RP-Adv messages and configure a C-BSR and a C-RP on VLAN-interface 102 of Switch E.

```
<SwitchE> system-view
[SwitchE] acl number 2005
[SwitchE-acl-basic-2005] rule permit source 225.1.1.0 0.0.0.255
[SwitchE-acl-basic-2005] quit
[SwitchE] pim
[SwitchE-pim] c-bsr vlan-interface 102 24 1
[SwitchE-pim] c-rp vlan-interface 102 group-policy 2005 priority 1
[SwitchE-pim] quit
```

# On Switch F, enable IGMP Snooping globally and in VLAN 100.

```
<SwitchF> system-view
[SwitchF] igmp-snooping enable
  Enable IGMP-Snooping ok.
[SwitchF] vlan 100
[SwitchF-vlan100] igmp-snooping enable
[SwitchF-vlan100] quit
```

Verifying the configuration

Check the reception of multicast stream for multicast group 225.1.1.1 on Host A and Host C and verify the configurations made on the switches.

Using the following commands to determine whether Host A and Host C can receive multicast data

# View the PIM neighboring relationships on Switch E.

```
<SwitchE> display pim neighbor
Neighbor’s Address  Interface Name                Uptime    Expires
192.168.9.1         Vlan-interface102               02:47:04  00:01:42
192.168.2.1         Vlan-interface103               02:45:04  00:04:46
192.168.3.1         Vlan-interface104               02:42:24  00:04:45
192.168.4.2         Vlan-interface105               02:43:44  00:05:44
```

# View the BSR information on Switch E.

```
<SwitchE> display pim bsr-info
  Current BSR Address: 192.168.4.2
             Priority: 2
          Mask Length: 24
              Expires: 00:01:39
  Local Host is C-BSR: 192.168.9.2
             Priority: 1
          Mask Length: 24
```

# View the RP information on Switch E.

```
<SwitchE> display pim rp-info
 PIM-SM RP-SET information:
    BSR is: 192.168.4.2

    Group/MaskLen: 225.1.1.0/24
      RP 192.168.9.2
        Version: 2
        Priority: 1
        Uptime: 00:03:15
        Expires: 00:01:14
      RP 192.168.4.2
        Version: 2
        Priority: 2
        Uptime: 00:04:25
        Expires: 00:01:09
```

# View the PIM routing table on Switch A.

```
<SwitchA> display pim routing-table
PIM-SM Routing Table
Total 1 (S,G) entries, 1 (*,G) entries, 0 (*,*,RP) entry

(*, 225.1.1.1), RP 192.168.9.2
    Protocol 0x20: PIMSM, Flag 0x2003: RPT WC NULL_IIF
    Uptime: 00:23:21, never timeout
    Upstream interface: Vlan-interface102, RPF neighbor: 192.168.9.2
    Downstream interface list:
      Vlan-interface100, Protocol 0x1: IGMP, never timeout
(10.110.5.100, 225.1.1.1)
    Protocol 0x20: PIMSM, Flag 0x80004: SPT
    Uptime: 00:03:43, Timeout in 199 sec
    Upstream interface: Vlan-interface102, RPF neighbor: 192.168.9.2
    Downstream interface list:
      Vlan-interface100, Protocol 0x1: IGMP, never timeout
Matched 1 (S,G) entries, 1 (*,G) entries, 0 (*,*,RP) entry
```

The information on Switch B and Switch C is similar to that on Switch A.

# View the PIM routing table on Switch D.

```
<SwitchD> display pim routing-table
PIM-SM Routing Table
Total 1 (S,G) entry, 0 (*,G) entry, 0 (*,*,RP) entry

(10.110.5.100, 225.1.1.1)
    Protocol 0x20: PIMSM, Flag 0x4: SPT
    Uptime: 00:03:03, Timeout in 27 sec
    Upstream interface: Vlan-interface300, RPF neighbor: NULL
    Downstream interface list:
      Vlan-interface101, Protocol 0x200: SPT, timeout in 147 sec
      Vlan-interface105, Protocol 0x200: SPT, timeout in 145 sec
Matched 1 (S,G) entry, 0 (*,G) entry, 0 (*,*,RP) entry
```

# View the PIM routing table on Switch E.

```
<SwitchE> display pim routing-table
PIM-SM Routing Table
Total 1 (S,G) entry, 1 (*,G) entry, 0 (*,*,RP) entry

(*,225.1.1.1), RP 192.168.9.2
    Protocol 0x20: PIMSM, Flag 0x2003: RPT WC NULL_IIF
    Uptime: 00:02:34, Timeout in 176 sec
    Upstream interface: Null, RPF neighbor: 0.0.0.0
    Downstream interface list:
      Vlan-interface102, Protocol 0x100: RPT, timeout in 176 sec
      Vlan-interface103, Protocol 0x100: SPT, timeout in 135 sec

(10.110.5.100, 225.1.1.1)
    Protocol 0x20: PIMSM, Flag 0x4: SPT
    Uptime: 00:03:03, Timeout in 27 sec
    Upstream interface: Vlan-interface105, RPF neighbor: 192.168.4.2
    Downstream interface list:
      Vlan-interface102, Protocol 0x200: SPT, timeout in 147 sec
      Vlan-interface103, Protocol 0x200: SPT, timeout in 145 sec
Matched 1 (S,G) entry, 1 (*,G) entry, 0 (*,*,RP) entry
```

# View multicast group entries created by IGMP Snooping on Switch F.

```
<SwitchF> display igmp-snooping group
  Total 1 IP Group(s).
  Total 1 MAC Group(s).

  Vlan(id):100.
    Total 1 IP Group(s).
    Total 1 MAC Group(s).
    Router port(s):Ethernet1/0/2
    IP group(s):the following ip group(s) match to one mac group.
        IP group address:225.1.1.1
        Host port(s):Ethernet1/0/19
    MAC group(s):
        MAC group address:0100-5e01-0101
        Host port(s):Ethernet1/0/19
```

# View the multicast group information that contains port information on Switch B.

```
<SwitchB> display mpm group
  Total 1 IP Group(s).
  Total 1 MAC Group(s).

  Vlan(id):200.
    Total 1 IP Group(s).
    Total 1 MAC Group(s).
    Router port(s):
    IP group(s):the following ip group(s) match to one mac group.
        IP group address:225.1.1.1
        Host port(s):Ethernet1/0/24
    MAC group(s):
        MAC group address:0100-5e01-0101
        Host port(s):Ethernet1/0/24

  Vlan(id):103.
    Total 0 IP Group(s).
    Total 0 MAC Group(s).
    Router port(s):Ethernet1/0/10
```

As shown above, Host A and Host C can receive multicast data.

Configuring simulated joining

Configure simulated joining on Switch B, thus to prevent the multicast switch from considering that no multicast receiver exists on the subnet due to some reasons and pruning the corresponding path from the multicast forwarding tree.

# Configure Ethernet 1/0/21 as a simulated host to join multicast group 225.1.1.1.

```
<SwitchB> system-view
[SwitchB] interface Vlan-interface 200
[SwitchB-Vlan-interface200] igmp host-join 225.1.1.1 port Ethernet 1/0/21
```

# View the multicast group information that contains port information on Switch B.

```
<SwitchB> display mpm group
  Total 1 IP Group(s).
  Total 1 MAC Group(s).

  Vlan(id):200.
    Total 1 IP Group(s).
    Total 1 MAC Group(s).
    Router port(s):
    IP group(s):the following ip group(s) match to one mac group.
        IP group address:225.1.1.1
        Host port(s):Ethernet1/0/21             Ethernet1/0/24
    MAC group(s):
        MAC group address:0100-5e01-0101
        Host port(s):Ethernet1/0/21             Ethernet1/0/24
  Vlan(id):103.
    Total 0 IP Group(s).
    Total 0 MAC Group(s).
    Router port(s):Ethernet1/0/10
```

As shown above, Ethernet 1/0/21 has become a member port for multicast group 225.1.1.1.

Complete Configuration

Configuration on Switch A

```
#
multicast routing-enable
#
interface Vlan-interface100
 ip address 10.110.1.1 255.255.255.0
 igmp enable
 pim sm
#
interface Vlan-interface101
 ip address 192.168.1.1 255.255.255.0
 pim sm
#
interface Vlan-interface102
 ip address 192.168.9.1 255.255.255.0
 pim sm
#
```

Configuration on Switch B

```
#
multicast routing-enable
#
interface Vlan-interface103
 ip address 192.168.2.1 255.255.255.0
 pim sm
#
interface Vlan-interface200
 ip address 10.110.2.1 255.255.255.0
 igmp enable
 pim sm
#
interface Ethernet1/0/1
 igmp host-join 225.1.1.1 vlan 1
#
```

Configuration on Switch C

```
#
multicast routing-enable
#
interface Vlan-interface104
 ip address 192.168.3.1 255.255.255.0
 pim sm
#
interface Vlan-interface200
 ip address 10.110.2.2 255.255.255.0
 igmp enable
 pim sm
#
```

Configuration on Switch D

```
#
acl number 2005
 rule 0 permit source 225.1.1.0 0.0.0.255
#
multicast routing-enable
#
interface Vlan-interface101
 ip address 192.168.1.2 255.255.255.0
 pim sm
#
interface Vlan-interface105
 ip address 192.168.4.2 255.255.255.0
 pim sm
#
interface Vlan-interface300
 ip address 10.110.5.1 255.255.255.0
 pim sm
#
pim
 c-bsr Vlan-interface105 24 2
 c-rp Vlan-interface105 group-policy 2005 priority 2
#
```

Configuration on Switch E

```
#
acl number 2005
 rule 0 permit source 225.1.1.0 0.0.0.255
#
multicast routing-enable
#
interface Vlan-interface102
 ip address 192.168.9.2 255.255.255.0
 pim sm
#
interface Vlan-interface103
 ip address 192.168.2.2 255.255.255.0
 pim sm
#
interface Vlan-interface104
 ip address 192.168.3.2 255.255.255.0
 pim sm
#
interface Vlan-interface105
 ip address 192.168.4.1 255.255.255.0
 pim sm
#
pim
 c-bsr Vlan-interface102 24 1
 c-rp Vlan-interface102 group-policy 2005 priority 1
#
```

Configuration on Switch F

```
#
 igmp-snooping enable
#
```

```
vlan 100
 igmp-snooping enable
#
```

Precautions

- Only one C-BSR can be configured on a Layer 3 switch. Configuration of a C-BSR on another interface overwrites the previous configuration.
- It is recommended that C-BSRs and C-RPs be configured on Layer 3 switches in the backbone network.
- If you do not specify a group range for a C-RP, the C-RP will serve all multicast groups when it becomes the RP in the domain; otherwise it will serve the specified group range.
- You can configure a basic ACL to filter related multicast IP addresses, thus to control the multicast group range that a static RP serves.
- If you configure a static RP, you must perform the same configuration on all the routers in the PIM-SM domain.
- If the configured static RP address is the address of an interface in the up state on the local device, the local device will serve as a static RP.
- When the elected RP works properly, the static RP does not take effect.
- It is not necessary to enable PIM on the interface that serves as a static RP.
- Configuring a legal BSR address range can prevent the legal BSR from being replaced maliciously. With a legal BSR address range configured on all Layer 3 switches in the entire network, all these switches will discard bootstrap messages from out of the legal address range, thus to safeguard BSR in the network.
- To guard against C-RP spoofing, you can configure a legal C-RP address range and the range of multicast groups to be advertised by each C-RP.

Configuring PIM-DM plus IGMP

PIM-DM is a type of dense mode multicast protocol. It uses the “push mode” for multicast forwarding, and is suitable for small-sized networks with densely distributed multicast group members.

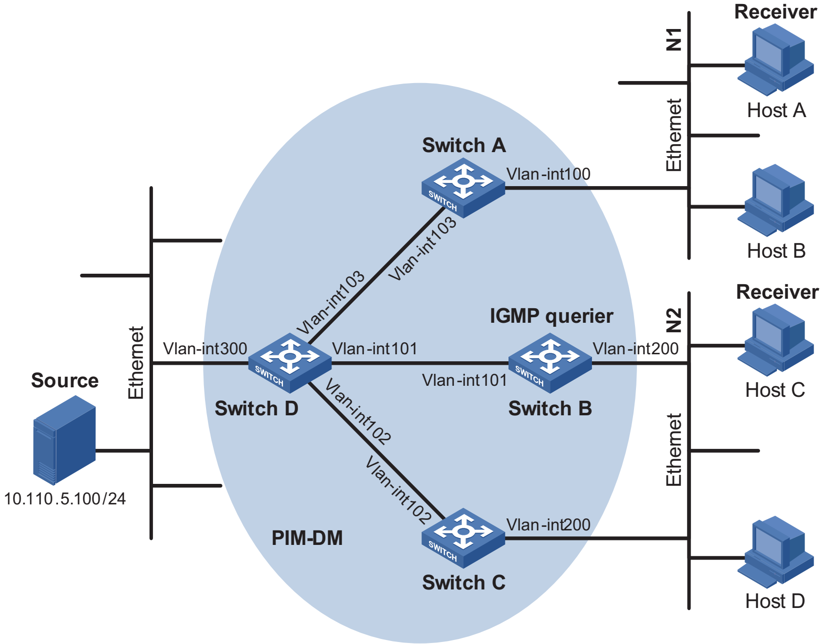
The basic implementation of PIM-DM is as follows:

- PIM-DM assumes that at least one multicast group member exists on each subnet of the network, and therefore multicast data is flooded to all nodes on the network. Then, branches without multicast receivers are pruned from the forwarding tree, leaving only those branches that contain receivers. This “flood and prune” process takes place periodically, that is, pruned branches resume multicast forwarding periodically.
- When a new receiver on a previously pruned branch joins a multicast group, to reduce the join latency, PIM-DM uses a graft mechanism to resume data forwarding to that branch.

In PIM-DM, the multicast forwarding path is a source tree, with the multicast source as its “root” and multicast group members as its “leaves”. Because the source tree is the shortest path from the multicast source to the receivers, it is also called shortest path tree (SPT).

Network Diagram

Figure 40 Network diagram for PIM-DM configuration



Device	Interface	IP address	Device	Interface	IP address
Switch A	Vlan-int100	10.110.1.1/24	Switch D	Vlan-int300	10.110.5.1/24
	Vlan-int103	192.168.1.1/24		Vlan-int103	192.168.1.2/24
Switch B	Vlan-int200	10.110.2.1/24		Vlan-int101	192.168.2.2/24
	Vlan-int101	192.168.2.1/24		Vlan-int102	192.168.3.2/24
Switch C	Vlan-int200	10.110.2.2/24			
	Vlan-int102	192.168.3.1/24			

Networking and Configuration Requirements

- Receivers receive multicast VOD information through multicast. The receiver groups of different organizations form two stub networks, and at least one receiver host exists in each stub network. The entire PIM domain operates in the dense mode.
- Host A and Host C are multicast receivers in the two stub networks.
- Switch D connects to the network that comprises the multicast source (Source) through VLAN-interface 300.
- Switch A connects to stub network N1 through VLAN-interface 100, and to Switch D through VLAN-interface 103.
- Switch B and Switch C connect to stub network N2 through their respective VLAN-interface 200, and to Switch D through VLAN-interface 101 and VLAN-interface 102 respectively.
- IGMPv2 needs to run between Switch A and N1, and also between Switch B, Switch C, and N2. Typically Switch B acts as the querier.

Application Product Matrix

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions

Configuration Procedure

Configuring the interface IP addresses and unicast routing protocol for each switch

Configure the IP address and subnet mask for each interface as per Figure 40. The detailed configuration steps are omitted here.

Configure OSPF for interoperation among the switches in the PIM-DM domain. Ensure the network-layer interoperation among Switch A, Switch B, Switch C, and Switch D in the PIM-DM domain and enable dynamic update of routing information among the switches via unicast.

Enabling IP multicast routing and enabling PIM-DM on each interface

# Enable IP multicast routing on Switch A, enable PIM-DM on each interface, and enable IGMP on VLAN-interface 100, which connects Switch A to the stub network.

```
<SwitchA> system-view
[SwitchA] multicast routing-enable
[SwitchA] interface vlan-interface 100
[SwitchA-Vlan-interface100] igmp enable
[SwitchA-Vlan-interface100] pim dm
[SwitchA-Vlan-interface100] quit
[SwitchA] interface vlan-interface 103
[SwitchA-Vlan-interface103] pim dm
[SwitchA-Vlan-interface103] quit
```

The configuration on Switch B and Switch C is similar to the configuration on Switch A.

# Enable multicast routing on Switch D, and enable PIM-DM on each interface.

```
<SwitchD> system-view
[SwitchD] multicast routing-enable
[SwitchD] interface vlan-interface 300
[SwitchD-Vlan-interface300] pim dm
[SwitchD-Vlan-interface300] quit
[SwitchD] interface vlan-interface 103
[SwitchD-Vlan-interface103] pim dm
[SwitchD-Vlan-interface103] quit
[SwitchD] interface vlan-interface 101
[SwitchD-Vlan-interface101] pim dm
[SwitchD-Vlan-interface101] quit
[SwitchD] interface vlan-interface 102
[SwitchD-Vlan-interface102] pim dm
[SwitchD-Vlan-interface102] quit
```

Verifying the configuration

Carry out the **display pim neighbor** command to view the PIM neighboring relationships among the switches. For example:

# View the PIM neighboring relationships on Switch D.

```
[SwitchD] display pim neighbor
Neighbor’s Address  Interface Name                Uptime    Expires
192.168.1.1        Vlan-interface1               00:47:08  00:01:39
192.168.2.1        Vlan-interface1               00:48:05  00:01:29
192.168.3.1        Vlan-interface1               00:49:08  00:01:34
```

Use the **display pim routing-table** command to view the PIM routing information on the switches. For example:

# View the PIM routing table on Switch A.

```
<SwitchA> display pim routing-table
PIM-DM Routing Table
Total 1 (S,G) entry

(10.110.5.100, 225.1.1.1)
    Protocol 0x40: PIMDM, Flag 0xC: SPT NEG_CACHE
    Uptime: 00:00:23, Timeout in 187 sec
    Upstream interface: Vlan-interface103, RPF neighbor: 192.168.1.2
    Downstream interface list:
      Vlan-interface100, Protocol 0x1: IGMP, never timeout

Matched 1 (S,G) entry
```

The displayed information on Switch B and Switch C is similar to that on Switch A.

# View the PIM routing table on Switch D.

```
<SwitchD> display pim routing-table
PIM-DM Routing Table
Total 1 (S,G) entry

(10.110.5.100, 225.1.1.1)
    Protocol 0x40: PIMDM, Flag 0xC: SPT NEG_CACHE
    Uptime: 00:00:23, Timeout in 187 sec
    Upstream interface: Vlan-interface300, RPF neighbor: NULL
    Downstream interface list:
      Vlan-interface101, Protocol 0x200: SPT, timeout in 147 sec
      Vlan-interface103, Protocol 0x200: SPT, timeout in 145 sec
      Vlan-interface103, Protocol 0x200: SPT, timeout in 145 sec

Matched 1 (S,G) entry
```

Complete Configuration

Configuration on Switch A

```
#
 multicast routing-enable
#
interface Vlan-interface100
 ip address 10.110.1.1 255.255.255.0.
 igmp enable
 pim dm
#
interface Vlan-interface103
 ip address 192.168.1.1 255.255.255.0
 pim dm
#
```

Configuration on Switch B

```
#
 multicast routing-enable
#
interface Vlan-interface101
```

```
 ip address 192.168.2.1 255.255.255.0.
 pim dm
#
interface Vlan-interface200
 ip address 10.110.2.1 255.255.255.0
 igmp enable
 pim dm
#
```

Configuration on Switch C

```
#
 multicast routing-enable
#
interface Vlan-interface102
 ip address 192.168.3.1 255.255.255.0.
 pim dm
#
interface Vlan-interface200
 ip address 10.110.2.2 255.255.255.0
 igmp enable
 pim dm
#
```

Configuration on Switch D

```
#
 multicast routing-enable
#
interface Vlan-interface101
 ip address 192.168.2.2 255.255.255.0.
 pim dm
#
interface Vlan-interface102
 ip address 192.168.3.2 255.255.255.0
 pim dm
#
interface Vlan-interface103
 ip address 192.168.1.2 255.255.255.0
 pim dm
#
interface Vlan-interface300
 ip address 10.110.5.1 255.255.255.0
 pim dm
#
```

Precautions

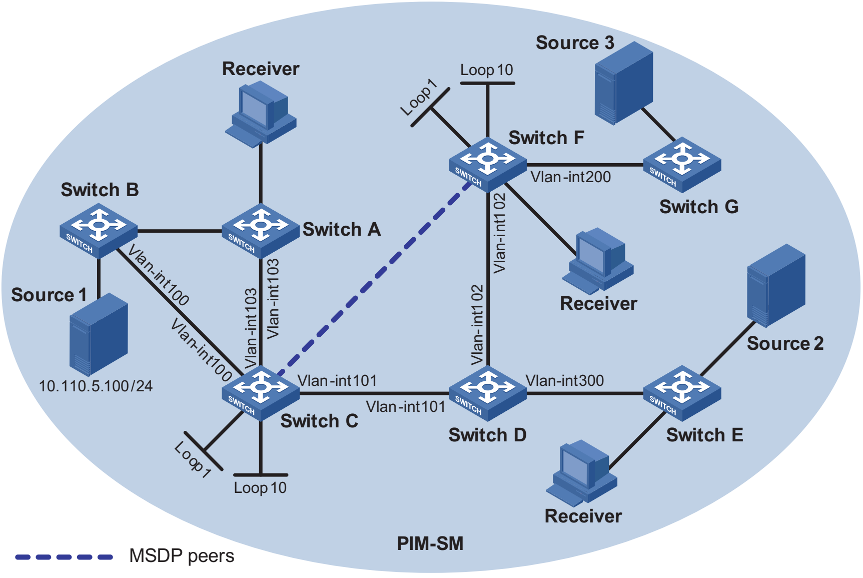
When deploying a PIM-DM domain, you are recommended to enable PIM-DM on all interfaces of non-border routers.

Configuring Anycast RP Application

Anycast RP enables load balancing and redundancy backup between two or more RPs within a PIM-SM domain by configuring the same IP address for these RPs and establishing MSDP peering relationships between the RPs.

Network Diagram

Figure 41 Network diagram for anycast RP configuration



Device	Interface	IP address	Device	Interface	IP address
Switch A	Vlan-int103	10.110.1.2/24	Switch D	Vlan-int300	10.110.4.1/24
Switch B	Vlan-int100	10.110.2.2/24		Vlan-int102	192.168.3.1
Switch C	Vlan-int103	10.110.1.1/24		Vlan-int101	192.168.1.2/24
	Vlan-int100	10.110.2.1/24	Switch F	Vlan-int200	10.110.3.1/24
	Vlan-int101	192.168.1.1/24		Vlan-int102	192.168.3.2/24
	Loop1	3.3.3.3/32		Loop1	4.4.4.4/32
	Loop10	10.1.1.1/32		Loop10	10.1.1.1/32

Networking and Configuration Requirements

- The PIM-SM domain in this example has multiple multicast sources and receivers. OSPF needs to run in the domain to provide unicast routes.
- The anycast RP application needs to be is configured in the PIM-SM domain, so that the last-hop switch joins the topologically nearest RP.
- An MSDP peering relationship needs to be set up between Switch C and Switch F.
- On Switch C and Switch F, the interface Loopback 1 needs to be configured as a C-BSR, and Loopback 10 as a C-RP.
- The router ID of Switch C is 1.1.1.1, while the router ID of Switch F is 2.2.2.2.

Application Product Matrix

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions

Configuration Procedure

Configuring the interface IP addresses and unicast routing protocol for each switch

Configure the IP address and subnet mask for each interface as per Figure 41. The detailed configuration steps are omitted here.

Configure OSPF for interconnection between the switches. The detailed configuration steps are omitted here.

Enabling IP multicast routing and enabling PIM-SM on each interface

# Enable multicast routing on Switch C, and enable PIM-SM on each interface.

```
<SwitchC> system-view
[SwitchC] multicast routing-enable
[SwitchC] interface vlan-interface 103
[SwitchC-Vlan-interface103] pim sm
[SwitchC-Vlan-interface103] quit
[SwitchC] interface vlan-interface 100
[SwitchC-Vlan-interface100] pim sm
[SwitchC-Vlan-interface100] quit
[SwitchC] interface Vlan-interface 101
[SwitchC-Vlan-interface101] pim sm
[SwitchC-Vlan-interface101] quit
```

The configuration on Switch A, Switch B, Switch D, Switch E, Switch F, and Switch G is similar to the configuration on Switch C. The specific configuration steps are omitted here.

Configuring the IP addresses of interface Loopback 1, Loopback 10, C-BSR, and C-RP

# Configure different Loopback 1 addresses and identical Loopback 10 address on Switch C and Switch F, configure a C-BSR on each Loopback 1 and configure a C-RP on each Loopback 10.

```
[SwitchC] interface loopback 1
[SwitchC-LoopBack1] ip address 3.3.3.3 255.255.255.255
[SwitchC-LoopBack1] pim sm
[SwitchC-LoopBack1] quit
[SwitchC] interface loopback 10
[SwitchC-LoopBack10] ip address 10.1.1.1 255.255.255.255
[SwitchC-LoopBack10] pim sm
[SwitchC-LoopBack10] quit
[SwitchC] pim
[SwitchC-pim] c-bsr loopback 1 24
[SwitchC-pim] c-rp loopback 10
[SwitchC-pim] quit
```

The configuration on Switch F is similar to the configuration on Switch C.

# View the PIM routing information on Switch C.

```
[SwitchC] display pim routing-table
PIM-SM Routing Table
Total 1 (S,G) entries, 0 (*,G) entry, 0 (*,*,RP) entry

(10.110.5.100, 225.1.1.1)
    Protocol 0x20: PIMSM, Flag 0x80004: SPT
    Uptime: 00:00:08, Timeout in 203 sec
    Upstream interface: Vlan-interface1, RPF neighbor: NULL
    Downstream interface list: NULL

Matched 1 (S,G) entries, 0 (*,G) entry, 0 (*,*,RP) entry
```

As shown above, the multicast source has been registered on Switch C, which is deemed as the RP.

# View the PIM routing information on Switch F.

```
<Switch F>dis pim routing-table
PIM-SM Routing Table
Total 0 (S,G) entry, 1 (*,G) entries, 0 (*,*,RP) entry

(*, 225.1.1.1), RP 10.1.1.1
    Protocol 0x20: PIMSM, Flag 0x2003: RPT WC NULL_IIF
    Uptime: 00:00:12, never timeout
    Upstream interface: Null, RPF neighbor: 0.0.0.0
    Downstream interface list:
      Vlan-interface2, Protocol 0x1: IGMP, never timeout

Matched 0 (S,G) entry, 1 (*,G) entries, 0 (*,*,RP) entry
```

As shown above, the multicast receiver joins to Switch F, rooted at which an RPT has been established.

However, the RP for the multicast source is different from the RP for the multicast receiver, so the multicast receiver cannot receive multicast data yet. Anycast RP needs to be configured on these two RPs.

Configuring MSDP peers

# Configure an MSDP peer on Switch C.

```
[SwitchC] msdp
[SwitchC-msdp] originating-rp Vlan-interface 101
[SwitchC-msdp] peer 192.168.3.2 connect-interface Vlan-interface 101
[SwitchC-msdp] quit
```

# Configure an MSDP peer on Switch F.

```
[SwitchF] msdp
[SwitchF-msdp] originating-rp Vlan-interface 102
[SwitchF-msdp] peer 192.168.1.1 connect-interface Vlan-interface 102
[SwitchF-msdp] quit
```

You can use the **display msdp brief** command to view the brief information of MSDP peering relationships between the switches.

# View the brief MSDP peer information on Switch C.

```
[SwitchC] display msdp brief
MSDP Peer Brief Information
  Peer’s Address     State     Up/Down time    AS     SA Count   Reset Count
  192.168.3.2        Up        00:48:21        ?      2          0
```

# View the brief MSDP peer information on Switch F.

```
[SwitchF] display msdp brief
MSDP Peer Brief Information
  Peer’s Address     State     Up/Down time    AS     SA Count   Reset Count
  192.168.1.1        Up        00:50:22        ?      2          0
```

After the peering relationship is established, the multicast receiver can receive multicast data from the source.

# View the PIM routing information on Switch C again.

```
[Switch C] display pim routing-table
PIM-SM Routing Table
Total 1 (S,G) entries, 0 (*,G) entry, 0 (*,*,RP) entry

(10.110.5.100, 225.1.1.1)
    Protocol 0x20: PIMSM, Flag 0x80004: SPT
    Uptime: 00:00:55, Timeout in 208 sec
    Upstream interface: Vlan-interface1, RPF neighbor: NULL
    Downstream interface list:
      Vlan-interface2, Protocol 0x200: SPT, timeout in 200 sec

Matched 1 (S,G) entries, 0 (*,G) entry, 0 (*,*,RP) entry
```

# View the PIM routing information on Switch F again.

```
[SwitchF] display pim routing-table
PIM-SM Routing Table
Total 1 (S,G) entry, 3 (*,G) entries, 0 (*,*,RP) entry

(*, 224.1.1.1), RP 10.1.1.1
    Protocol 0x20: PIMSM, Flag 0x2003: RPT WC NULL_IIF
    Uptime: 00:25:26, never timeout
    Upstream interface: Null, RPF neighbor: 0.0.0.0
    Downstream interface list:
      Vlan-interface2, Protocol 0x1: IGMP, never timeout

(192.168.3.1, 224.1.1.1)
    Protocol 0x20: PIMSM, Flag 0x4: SPT
    Uptime: 00:02:56, Timeout in 202 sec
    Upstream interface: Vlan-interface1, RPF neighbor: 192.168.1.1
    Downstream interface list:
      Vlan-interface2, Protocol 0x1: IGMP, never timeout

Matched 1 (S,G) entry, 3 (*,G) entries, 0 (*,*,RP) entry
```

Complete Configuration

Configuration on Switch C

```
#
 multicast routing-enable
#
interface Vlan-interface100
 ip address 10.110.1.1 255.255.255.0.
 pim sm
#
interface Vlan-interface101
 ip address 192.168.1.1 255.255.255.0
pim sm
#
interface Vlan-interface103
 ip address 10.110.1.1 255.255.255.0
pim sm
#
interface LoopBack1
```

```
 ip address 3.3.3.3 255.255.255.255
 pim sm
#
interface LoopBack10
 ip address 10.1.1.1 255.255.255.255
 pim sm
#
pim
 c-bsr LoopBack1 24
 c-rp LoopBack10
#
msdp
 originating-rp Vlan-interface101
 peer 192.168.3.2 connect-interface Vlan-interface101
#
```

Configuration on Switch F

```
#
 multicast routing-enable
#
interface Vlan-interface102
 ip address 192.168.3.2 255.255.255.0
pim sm
#
interface Vlan-interface200
 ip address 10.110.3.1 255.255.255.0
pim sm
#
interface LoopBack1
 ip address 4.4.4.4 255.255.255.255
 pim sm
#
interface LoopBack10
 ip address 10.1.1.1 255.255.255.255
 pim sm
#
pim
 c-bsr LoopBack1 24
 c-rp LoopBack10
#
msdp
 originating-rp Vlan-interface102
 peer 192.168.1.1 connect-interface Vlan-interface102
#
```

Precautions

- Be sure to configure a 32-bit subnet mask (255.255.255.255) for the Anycast RP address, namely configure the Anycast RP address as a host address.
- An MSDP peer address must be different from the Anycast RP address.

17 802.1x Configuration Guide

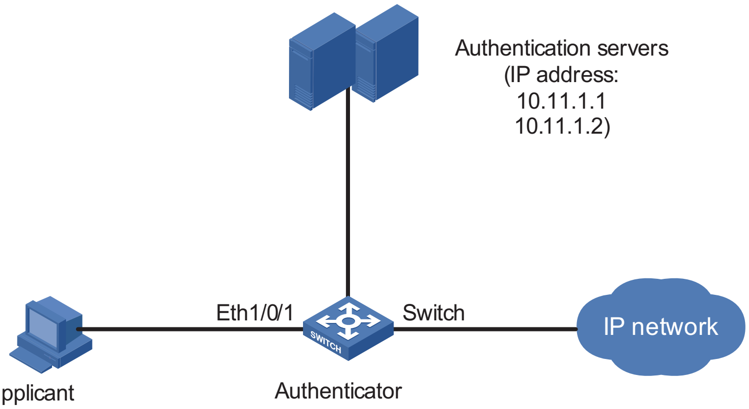
The following configurations involve most AAA/RADIUS configuration commands. Refer to "AAA Configuration" in the Configuration Guide for your product for information about the commands. Configurations on the user host and the RADIUS servers are omitted.

Configuring 802.1x Access Control

As a port-based access control protocol, 802.1x authenticates and controls access of users at the port level. A user host connected to an 802.1x-enabled port of an access control device can access the resources on the LAN only after passing authentication.

Network Diagram

Figure 42 Network diagram for configuring 802.1x access control



Networking and Configuration Requirements

- The switch authenticate supplicants on the port Ethernet 1/0/1 to control their access to the Internet by using the MAC-based access control method.
- All supplicants belong to the default domain named **aabbcc.net**, which can accommodate up to 30 users. When authenticating a supplicant, the switch tries the RADIUS scheme first and then the local scheme if the RADIUS server is not available. A supplicant is disconnected by force if accounting fails. In addition, the username of a supplicant is not suffixed with the domain name. A connection is terminated if the total size of the data passes through it during a period of 20 minutes is less than 2000 bytes.
- The switch is connected to a server group comprising of two RADIUS servers whose IP addresses are 10.11.1.1 and 10.11.1.2 respectively. The former operates as the primary authentication server and the secondary accounting server, while the latter operates as the secondary authentication server and the primary accounting server. The shared key for authentication message exchange is **name**, and that for accounting message exchange is **money**. If the switch sends a packet to the RADIUS server but receives no response in 5

seconds, it retransmits the packet for up to 5 times. The switch sends real-time accounting packets at an interval of 15 minutes. A username is sent to the RADIUS server with the domain name truncated.

- The username and password for local 802.1x authentication are **localuser** and **localpass** (in plain text) respectively. The idle disconnecting function is enabled.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

Enable 802.1x globally.

```
<3Com> system-view
[3Com] dot1x
```

# Enable 802.1x on Ethernet 1/0/1.

```
[3Com] dot1x interface Ethernet 1/0/1
```

# Set the access control method to MAC-based. This operation can be omitted because MAC-based is the default.

```
[3Com] dot1x port-method macbased interface Ethernet 1/0/1
```

# Create a RADIUS scheme named **radius1** and enter the RADIUS scheme view.

```
[3Com] radius scheme radius1
```

# Assign IP addresses to the primary authentication and accounting RADIUS servers.

```
[3Com-radius-radius1] primary authentication 10.11.1.1
[3Com-radius-radius1] primary accounting 10.11.1.2
```

# Assign IP addresses to the secondary authentication and accounting RADIUS servers.

```
[3Com-radius-radius1] secondary authentication 10.11.1.2
[3Com-radius-radius1] secondary accounting 10.11.1.1
```

# Set the shared key for message exchange between the switch and the RADIUS authentication server.

```
[3Com -radius-radius1] key authentication name
```

# Set the shared key for message exchange between the switch and the RADIUS accounting server.

```
[3Com-radius-radius1] key accounting money
```

# Set the interval and the number of packet transmission attempts for the switch to send packets to the RADIUS server.

```
[3Com-radius-radius1] timer 5
[3Com-radius-radius1] retry 5
```

# Set the interval for the switch to send real-time accounting packets to the RADIUS server.

```
[3Com-radius-radius1] timer realtime-accounting 15
```

# Configure the switch to send a username without the domain name to the RADIUS server.

```
[3Com-radius-radius1] user-name-format without-domain
[3Com-radius-radius1] quit
```

# Create a domain named **aabbcc.net** and enter its view.

```
[3Com] domain aabbcc.net
```

# Specify **radius1** as the RADIUS scheme of the user domain, and the local authentication scheme as the backup scheme when the RADIUS server is not available.

```
[3Com-isp-aabbcc.net] scheme radius-scheme radius1 local
```

# Specify the maximum number of users of the user domain to 30.

```
[3Com-isp-aabbcc.net] access-limit enable 30
```

# Enable the idle disconnecting function and set the related parameters.

```
[3Com-isp-aabbcc.net] idle-cut enable 20 2000
[3Com-isp-aabbcc.net] quit
```

# Set **aabbcc.net** as the default user domain.

```
[3Com] domain default enable aabbcc.net
```

# Create a local user.

```
[3Com] local-user localuser
[3Com-luser-localuser] service-type lan-access
[3Com-luser-localuser] password simple localpass
```

Complete Configuration

```
#
 domain default enable aabbcc.net
#
 dot1x
#
interface Ethernet1/0/1
dot1x
#
radius scheme system
radius scheme radius1
 server-type standard
 primary authentication 10.11.1.1
 primary accounting 10.11.1.2
 secondary authentication 10.11.1.2
 secondary accounting 10.11.1.1
 key authentication name
 key accounting money
 timer realtime-accounting 15
 timer response-timeout 5
 retry 5
 user-name-format without-domain
#
domain aabbcc.net
 scheme radius-scheme radius1 local
 access-limit enable 30
 idle-cut enable 20 2000
domain system
#
local-user localuser
 password simple localpass
 service-type lan-access
#
```

Precautions

1. 802.1x and the maximum number of MAC addresses that a port can learn are mutually exclusive. You cannot configure both of them on a port at the same time.
2. You can neither add an 802.1x-enabled port into an aggregation group nor enable 802.1x on a port which is a member of an aggregation group.
3. When a port uses the MAC-based access control method, users are authenticated individually and when a user goes offline, no other users are affected. When a port uses the port-based access control method, once a user passes authentication, all users on the port can access the network. But if the user gets offline, the port will be disabled and will log off all the other users.
4. If you use the **dot1x port-method** command to change the port access method, all online users will be logged off by force.
5. Handshake packet transmission needs the support of the 3Com private client. The handshake packets are used to detect whether a user is online.

18 AAA Configuration Guide

Configuring RADIUS Authentication for Telnet Users

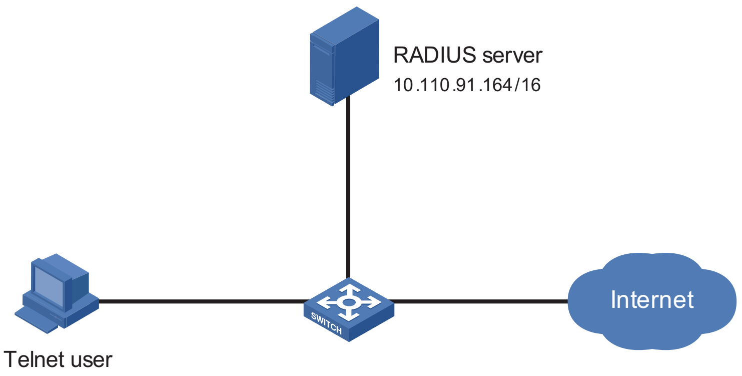
Authentication, Authorization and Accounting (AAA) is a uniform framework used to configure the three functions for network security management. It can be implemented by multiple protocols.

RADIUS configurations are made in RADIUS schemes. When performing RADIUS configurations, you first create a RADIUS scheme and then specify the IP addresses and UDP port numbers of the RADIUS servers for the scheme. These RADIUS servers include the primary and secondary authentication/authorization severs and accounting servers. In addition, you need to configure the shared key and specify the RADIUS server type.

In practice, you can configure the above parameters as required. But you should configure at least one authentication/authorization server and one accounting server. If no accounting server is needed, you must configure the **accounting optional** command. Besides, the RADIUS server port settings on the switch must be consistent with those on the RADIUS servers.

Network Diagram

Figure 43 Network diagram for configuring RADIUS authentication for Telnet users



Networking and Configuration Requirements

As shown in Figure 43, configure the switch so that Telnet users logging into the switch are authenticated remotely by the RADIUS server.

- A RADIUS authentication server with an IP address of 10.110.91.164 is connected to the switch.
- On the switch, set the shared key for exchanging messages with the authentication RADIUS server to **aabbcc**.
- A CAMS server is used as the RADIUS server. Select **extended** as the server-type in the RADIUS scheme.
- On the RADIUS server, set the shared key for exchanging messages with the switch to **aabbcc**, configure the authentication port number, and add Telnet

usernames and login passwords. Note that the Telnet usernames added to the RADIUS server must be in the format of *userid@isp-name*.

- Configure the switch to include domain names in the usernames to be sent to the RADIUS server in the RADIUS scheme.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

Enter system view.

```
<3Com> system-view
```

# Configure the switch to use AAA authentication for Telnet users.

```
[3Com] user-interface vty 0 4
[3Com-ui-vty0-4] authentication-mode scheme
```

# Configure an ISP domain.

```
[3Com] domain cams
[3Com-isp-cams] access-limit enable 10
[3Com-isp-cams] quit
```

# Configure a RADIUS scheme.

```
[3Com] radius scheme cams
[3Com-radius-cams] accounting optional
[3Com-radius-cams] primary authentication 10.110.91.164
[3Com-radius-cams] key authentication aabbcc
[3Com-radius-cams] server-type extended
[3Com-radius-cams] user-name-format with-domain
[3Com-radius-cams] quit
```

# Associate the ISP domain with the RADIUS scheme.

```
[3Com] domain cams
[3Com-isp-cams] scheme radius-scheme cams
```

Complete Configuration

```
#
system-view
#
user-interface vty 0 4
authentication-mode scheme
#
domain cams
access-limit enable 10
quit
#
radius scheme cams
accounting optional
```

```
primary authentication 10.110.91.164
key authentication aabbcc
server-type extended
user-name-format with-domain
quit
#
domain cams
scheme radius-scheme cams
```

Precautions

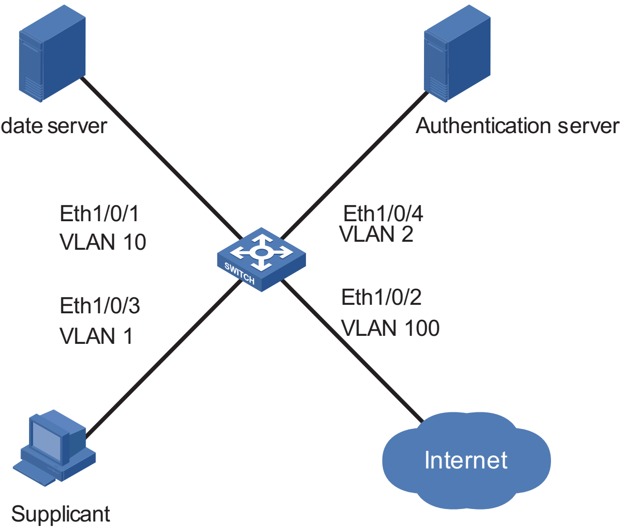
The Telnet user needs to enter the username with the domain name **cams**, in the format *userid*@cams, so that the user is authenticated according to the configuration of the domain **cams**.

Configuring Dynamic VLAN Assignment with RADIUS Authentication

With the dynamic VLAN assignment function, a switch can dynamically assign an authenticated user to a specific VLAN according to the attributes issued by the RADIUS server, thus restricting the user to specific network resources.

Network Diagram

Figure 44 Network diagram for configuring dynamic VLAN assignment with RADIUS authentication



Networking and Configuration Requirements

You are required to configure the switch so that users logging into the switch are authenticated and restricted to specific network resources. The detailed requirements are as follows:

- All users must pass authentication to access the network.
- Users can access only VLAN 10 before passing authentication.
- Users passing authentication can access VLAN 100.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Product series	Software version	Hardware version
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

Create a RADIUS scheme named **cams** and specify the primary and secondary servers.

```
<3Com> system-view
[3Com] radius scheme cams
[3Com-radius-cams] primary authentication 192.168.1.19
[3Com-radius-cams] primary accounting 192.168.1.19
[3Com-radius-cams] secondary authentication 192.168.1.20
[3Com-radius-cams] secondary accounting 192.168.1.20
```

# Set the shared key for message exchange with the authentication and accounting RADIUS servers to **expert**.

```
[3Com-radius-cams] key authentication expert
[3Com-radius-cams] key accounting expert
```

# Configure the switch to send a username with the domain name.

```
[3Com-radius-cams] user-name-format with-domain
```

# Specify the server type as **extended**.

```
[3Com-radius-cams] server-type extended
```

# Create an ISP domain named **abc**, bind RADIUS scheme **cams** for authentication, and configure dynamic VLAN assignment.

```
[3Com] domain abc
[3Com-isp-abc] radius-scheme cams
[3Com-isp-abc] vlan-assignment-mode integer
[3Com-isp-abc] quit
```

# Configure the ISP domain **abc** as the default ISP domain.

```
[3Com] domain default enable abc
```

# Enable guest VLAN on the port.

```
[3Com] interface Ethernet 1/0/3
[3Com-Ethernet1/0/3] dot1x port-method portbased
[3Com-Ehternet1/0/3] dot1x guest-vlan 10
```

# Enabled 802.1x.

```
[3Com] dot1x
```

# Enable 802.1x in interface view.

```
[3Com] interface Ethernet 1/0/3
[3Com-Ethernet1/0/3] dot1x
```

Complete Configuration

```
#
system-view
```

```
radius scheme cams
primary authentication 192.168.1.19
primary accounting 192.168.1.19
secondary authentication 192.168.1.20
secondary accounting 192.168.1.20
key authentication expert
key accounting expert
user-name-format with-domain
server-type extended
#
domain abc
radius-scheme cams
vlan-assignment-mode integer
quit
#
domain default enable abc
#
interface Ethernet 1/0/3
dot1x port-method portbased
dot1x guest-vlan 10
#
dot1x
#
interface Ethernet 1/0/3
dot1x
```

Precautions

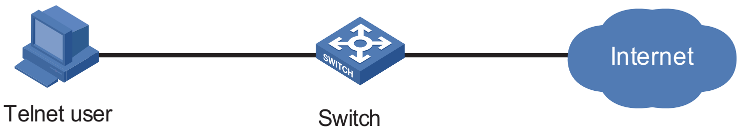
The above describes only the configurations on the switch. Configurations like adding users and configuring VLAN assignment on the RADIUS server are omitted.

Configuring Local Authentication for Telnet Users

In local authentication mode, user information including the username, password and related attributes are stored in the switch. Local authentication features high speed and low cost, but the amount of stored information depends on the hardware capacity.

Network Diagram

Figure 45 Network diagram for configuring local authentication for Telnet users



Networking and Configuration Requirements

As shown in Figure 45, you are required to configure the switch so that Telnet users logging into the switch are authenticated locally by the switch.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

Enter system view.

```
<3Com> system-view
```

# Configure the switch to use AAA authentication for Telnet users.

```
[3Com] user-interface vty 0 4
[3Com-ui-vty0-4] authentication-mode scheme
[3Com-ui-vty0-4] quit
```

# Configure a local user named **telnet**.

```
[3Com] local-user telnet
[3Com-luser-telnet] service-type telnet
[3Com-luser-telnet] password simple aabbcc
[3Com-luser-telnet] attribute idle-cut 300 access-limit 5
[3Com] domain system
[3Com-isp-system] scheme local
```

Complete Configuration

```
#
system-view
#
user-interface vty 0 4
authentication-mode scheme
quit
#
local-user telnet
service-type telnet
password simple aabbcc
attribute idle-cut 300 access-limit 5
domain system
scheme local
```

Precautions

The Telnet user needs to enter the username with the domain name **system** (that is, telnet@system), so that the user is authenticated according to the configuration of the **system** domain.

The configurations of local authentication for FTP users are similar to those for Telnet users.

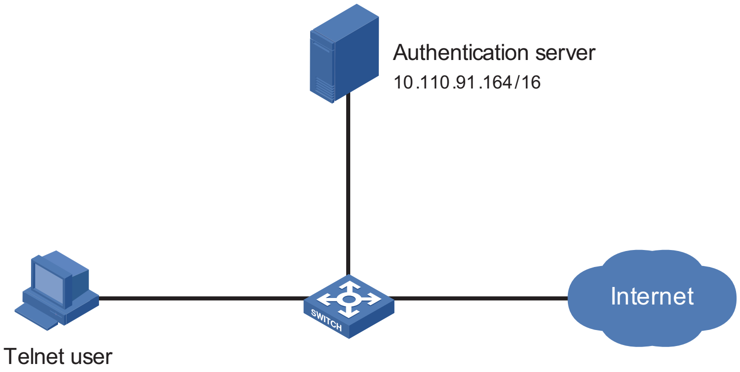
Configuring HWTACACS Authentication for Telnet Users

3Com Terminal Access Controller Access Control System (HWTACACS) is an enhanced security protocol based on TACACS (RFC 1492). Similar to the RADIUS protocol, it adopts the client/server model and implements AAA for multiple types of users through communicating with TACACS servers.

Compared with RADIUS, HWTACACS provides more reliable transmission and encryption, and therefore is more suitable for security control.

Network Diagram

Figure 46 Network diagram for configuring HWTACACS authentication for Telnet users



Networking and Configuration Requirements

As shown in Figure 46, you are required to configure the switch so that Telnet users logging into the switch are authenticated and authorized by the TACACS servers.

A TACACS server with the IP address 10.110.91.164 is connected to the switch. It will be used as the authentication, authorization and accounting server.

On the switch, set the shared keys for exchanging authentication, authorization and accounting messages with the TACACS server to **expert**. Configure the switch to strip domain names off usernames before sending usernames to the TACACS server.

On the TACACS server, configure the shared keys to **expert** for exchanging messages with the switch, and add Telnet usernames and login passwords.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

Configure a HWTACACS scheme.

```
<3Com> system-view
[3Com] hwtacacs scheme hwtac
[3Com-hwtacacs-hwtac] primary authentication 10.110.91.164 49
[3Com-hwtacacs-hwtac] primary authorization 10.110.91.164 49
[3Com-hwtacacs-hwtac] key authentication expert
[3Com-hwtacacs-hwtac] key authorization expert
[3Com-hwtacacs-hwtac] user-name-format without-domain
[3Com-hwtacacs-hwtac] quit
```

# Configure domain **hwtacacs** to use HWTACACS scheme **hwtac**.

```
[3Com] domain hwtacacs
[3Com-isp-hwtacacs] scheme hwtacacs-scheme hwtac
[3Com-isp-hwtacacs] accounting optional
```

Complete Configuration

```
#
system-view
hwtacacs scheme hwtac
primary authentication 10.110.91.164 49
primary authorization 10.110.91.164 49
key authentication expert
key authorization expert
user-name-format without-domain
quit
#
domain hwtacacs
scheme hwtacacs-scheme hwtac
accounting optional
```

Precautions

The above describes only the configuration of the HWTACACS scheme on the switch. The configuration of Telnet users on the HWTACACS server is omitted.

Configuring EAD

Endpoint Admission Defense (EAD) is an attack defense solution. By controlling access of terminals, it enhances the active defense capability of network endpoints and prevents viruses and worms from spreading on the network, thus securing the entire network.

With the cooperation of the switch, AAA sever, security policy server and security client, EAD is able to evaluate the security compliance of network endpoints and dynamically control their access rights.

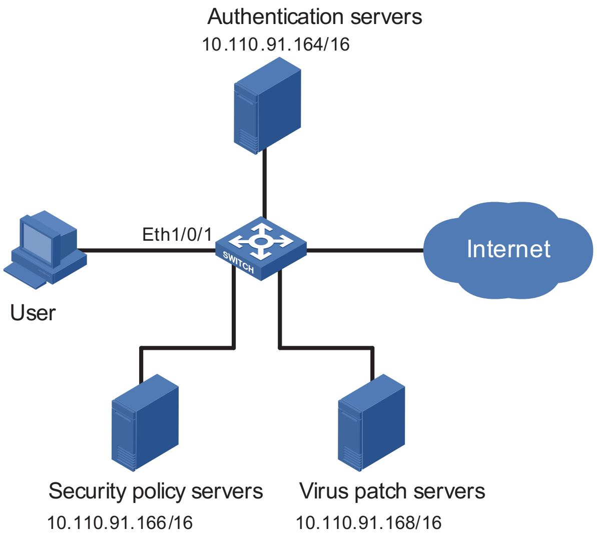
With EAD, a switch verifies the validity of the session control packets it receives according to the source IP addresses of the packets:

It regards only packets from the authentication and security policy servers valid.

It assigns ACLs according to session control packets, thus controlling the access rights of users dynamically.

Network Diagram

Figure 47 Network diagram for configuring EAD



Networking and Configuration Requirements

As shown in Figure 47, a user host is connected to Ethernet 1/0/1 on the switch. On the host runs the 802.1x client supporting 3Com EAD extended function. You are required to configure the switch to use the RADIUS server for remote user authentication and the security policy server for EAD control of users.

A CAMS server acts as the RADIUS server and another acts as the security policy server.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

Configure 802.1x on the switch.

Omitted

# Configure an ISP domain.

```
<3Com> system-view
[3Com] domain system
[3Com-isp-system] quit
```

# Configure a RADIUS scheme.

```
[3Com] radius scheme cams
[3Com-radius-cams] primary authentication 10.110.91.164 1812
[3Com-radius-cams] accounting optional
[3Com-radius-cams] key authentication expert
[3Com-radius-cams] server-type extended
```

# Specify the IP address of the security policy server.

```
[3Com-radius-cams] security-policy-server 10.110.91.166
```

# Associate the ISP domain with the RADIUS scheme.

```
[3Com-radius-cams] quit
[3Com] domain system
[3Com-isp-system] radius-scheme cams
```

Complete Configuration

```
#
system-view
domain system
quit
#
radius scheme cams
primary authentication 10.110.91.164 1812
accounting optional
key authentication expert
server-type extended
security-policy-server 10.110.91.166
#
```

```
quit
domain system
radius-scheme cams
```

Precautions

To support all extended functions of CAMS, you are recommended to configure the 802.1x authentication method as EAP and the RADIUS scheme server type as extended on the switch.

19 MAC AUTHENTICATION CONFIGURATION GUIDE

Configuring MAC Authentication

MAC authentication provides a way for authenticating users based on ports and MAC addresses, without requiring any client software to be installed on the hosts. Once detecting a new MAC address, a switch with MAC authentication configured will initiate the authentication process. During authentication, the user does not need to enter any username and password manually.

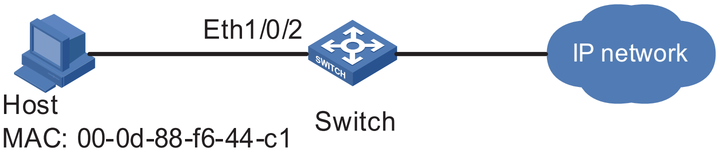
MAC authentication can be implemented locally or by a RADIUS server.

After determining the authentication mode, you can select one of the following username types as required:

- MAC address, where the MAC address of a user serves as the username for authentication (you can use the **mac-authentication authmode usernameasmacaddress usernameformat** command to set the MAC address format).
- Fixed username, where the same username and password preconfigured on the switch are used to authenticate all users. In addition, the number of concurrent users is limited with this username type. This username type is not recommended.

Network Diagram

Figure 48 Network diagram for configuring local MAC authentication



Networking and Configuration Requirements

As illustrated in Figure 48, a supplicant is connected to the switch through port Ethernet 1/0/2.

- MAC authentication is required on port Ethernet 1/0/2 to control user access to the Internet.
- All users belong to domain **aabbcc.net**. The authentication is performed locally and the MAC address of the PC (00-0d-88-f6-44-c1) is used as both the username and password.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Product series	Software version	Hardware version
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

# Enable MAC authentication for port Ethernet 1/0/2.

```
<3Com> system-view
[3Com] mac-authentication interface Ethernet 1/0/2
```

# Specify the MAC authentication username type as MAC address and the MAC address format as **with-hyphen**.

```
[3Com] mac-authentication authmode usernameasmacaddress usernameform
at with-hyphen
```

# Create a local user account.

- Specify the username and password.

```
[3Com] local-user 00-0d-88-f6-44-c1
[3Com-luser-00-0d-88-f6-44-c1] password simple 00-0d-88-f6-44-c1
```

- Set the service type to **lan-access**.

```
[3Com-luser-00-0d-88-f6-44-c1] service-type lan-access
[3Com-luser-00-0d-88-f6-44-c1] quit
```

# Create an ISP domain named **aabbcc.net**.

```
[3Com] domain aabbcc.net
New Domain added.
```

# Configure domain **aabbcc.net** to perform local authentication.

```
[3Com-isp-aabbcc.net] scheme local
[3Com-isp-aabbcc.net] quit
```

# Specify **aabbcc.net** as the ISP domain for MAC authentication.

```
[3Com] mac-authentication domain aabbcc.net
```

# Enable MAC authentication globally.

```
[3Com] mac-authentication
```

After configuring the above command, your MAC authentication configuration will take effect immediately, and Only the user with the MAC address of 00-0d-88-f6-44-c1 is allowed to access the Internet through port Ethernet 1/0/2. Note that enabling authentication globally is usually the last step in configuring access control related features. Otherwise, valid users may be denied access to the networks because of incomplete configuration.

Complete Configuration

```
#
 domain default enable aabbcc.net
#
 MAC-authentication
 MAC-authentication domain aabbcc.net
 MAC-authentication authmode usernameasmacaddress usernameformat wit
```

```
h-hyphen #
domain aabbcc.net
#
local-user 00-0d-88-f6-44-c1
 password simple 00-0d-88-f6-44-c1
 service-type lan-access
#
```

Precautions

- You cannot configure the maximum number of MAC addresses that can be learnt on a MAC authentication enabled port, or enable MAC authentication on a port that is configured with the maximum number of MAC addresses that can be learnt.
- You cannot configure port security on a MAC authentication enabled port, or enable MAC authentication on a port that is configured with port security.

20 VRRP Configuration Guide

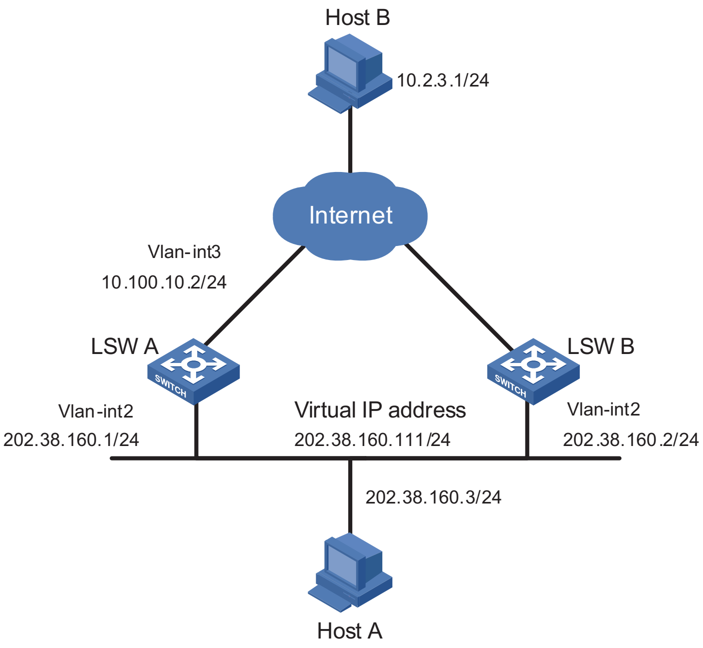
Single VRRP Group Configuration

Virtual Router Redundancy Protocol (VRRP) is an error-tolerant protocol defined in RFC 2338. In LANs with multicast or broadcast capabilities (such as Ethernet), VRRP can avoid single point failure through establishing backup links without modifying the configuration of dynamic routing protocols and router discovery protocols.

You can add two or more switches into a single VRRP group, which can provide two or more reliable links to the outside networks, therefore avoiding communication interruption resulting from single- or multi- point failure.

Network Diagram

Figure 49 Network diagram for VRRP



Networking and Configuration Requirements

Host A accesses Host B on the Internet, with the VRRP group consisting of Switch A and Switch B as its default gateway.

VRRP group settings:

- VRRP group number: 1
- Virtual router IP address of the VRRP group: 202.38.160.111.
- Switch A acts as the master.
- Switch B acts as the backup, and works in the preemptive mode.

Table 1 Networking description

Switch	Ethernet port connected with Host A	IP address of the VLAN interface	Switch priority in the VRRP group	Working mode
LSW-A	Ethernet 1/0/6	202.38.160.1/24	110	Preemptive mode
LSW-B	Ethernet 1/0/5	202.38.160.2/24	100 (default)	Preemptive mode

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions

Configuration Procedure

1 Configure Switch A.

# Configure VLAN 2.

```
<LSW-A> system-view
[LSW-A] vlan 2
[LSW-A-vlan2] port Ethernet1/0/6
[LSW-A-vlan2] quit
[LSW-A] interface Vlan-interface 2
[LSW-A-Vlan-interface2] ip address 202.38.160.1 255.255.255.0
[LSW-A-Vlan-interface2] quit
```

# Enable a VRRP group to respond to ping operations destined for its virtual IP address.

```
[LSW-A] vrrp ping-enable
```

# Create a VRRP group.

```
[LSW-A] interface Vlan-interface 2
[LSW-A-Vlan-interface2] vrrp vrid 1 virtual-ip 202.38.160.111
```

# Set the priority of Switch A in the VRRP group to 110.

```
[LSW-A-Vlan-interface2] vrrp vrid 1 priority 110
```

# Configure preemptive mode for the VRRP group.

```
[LSW-A-Vlan-interface2] vrrp vrid 1 preempt-mode
```

By default, a VRRP group adopts the preemptive mode.

2 Configure Switch B.

# Configure VLAN 2.

```
<LSW-B> system-view
[LSW-B] vlan 2
[LSW-B-Vlan2] port Ethernet1/0/5
[LSW-B-vlan2] quit
```

```
[LSW-B] interface Vlan-interface 2
[LSW-B-Vlan-interface2] ip address 202.38.160.2 255.255.255.0
[LSW-B-Vlan-interface2] quit
```

# Enable the VRRP group to respond to ping operations destined for its virtual IP address.

```
[LSW-B] vrrp ping-enable
```

# Create a VRRP group.

```
[LSW-B] interface vlan 2
[LSW-B-Vlan-interface2] vrrp vrid 1 virtual-ip 202.38.160.111
```

# Configure preemptive mode for the VRRP group.

```
[LSW-B-Vlan-interface2] vrrp vrid 1 preempt-mode
```

The default gateway of Host A is configured as 202.38.160.111.

Normally, Switch A functions as the gateway. When Switch A is turned off or fails, Switch B functions as the gateway.

Because Switch A is configured to work in the preemptive mode, when Switch A resumes to work, it becomes the master again to function as the gateway.

Complete Configuration

- Configurations on Switch A

```
#
vrrp ping-enable
#
interface Vlan-interface1
ip address 202.38.160.1 255.255.255.0
vrrp vrid 1 virtual-ip 202.38.160.111
vrrp vrid 1 priority 110
#
interface Ethernet1/0/6
port access vlan 2
#
```

- Configurations on Switch B

```
#
vrrp ping-enable
#
interface Vlan-interface1
ip address 202.38.160.2 255.255.255.0
vrrp vrid 1 virtual-ip 202.38.160.111
#
interface Ethernet1/0/5
port access vlan 2
#
```

Precautions

- The Switch 5500 supports VRRP, while the Switch 4500 does not.
- For the IP address owner, its priority in the VRRP group is always 255.
- Do not configure multiple VRRP groups on the same VLAN interface. Otherwise, the VRRP function will be affected.

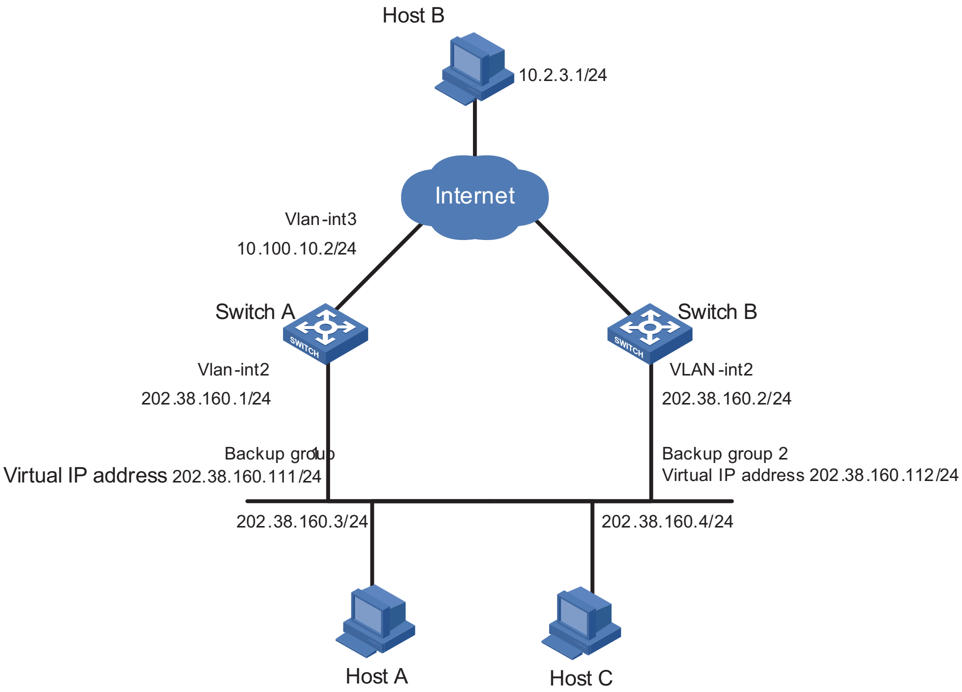
- If both switches in the preemptive mode and switches in the non-preemptive mode exist in a VRRP group, the working mode of the VRRP group conforms to that of the master. For example, if the master works in the preemptive mode, when the master fails, the VRRP group will elect a new master through preemption although there are switches working in the non-preemptive mode.

Multiple VRRP Groups Configuration

Multiple VRRP groups can implement the link backup and load sharing functions, which can avoid communication interruption resulting from switch failure or traffic overburden on a link.

Network Diagram

Figure 50 Network diagram for VRRP



Networking and Configuration Requirements

A switch can backup multiple VRRP groups.

Multiple-VRRP group configuration can implement load sharing. For example, Switch A acts as the master of VRRP group 1 and a backup of VRRP group 2. Switch B acts as the master of VRRP group 2 and a backup of VRRP group 1. Some hosts in the network take VRRP group 1 as the gateway, while the others take VRRP group 2 as the gateway. In this way, both load sharing and mutual backup are implemented.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions

Configuration Procedure

- Configure Switch A.

# Configure VLAN 2.

```
<LSW-A> system-view
[LSW-A] vlan 2
[LSW-A-vlan2] port Ethernet1/0/6
[LSW-A-vlan2] quit
[LSW-A] interface Vlan-interface 2
[LSW-A-Vlan-interface2] ip address 202.38.160.1 255.255.255.0
```

# Create VRRP group 1.

```
[LSW-A-Vlan-interface2] vrrp vrid 1 virtual-ip 202.38.160.111
```

# Set the priority of Switch A in VRRP group 1 to 150.

```
[LSW-A-Vlan-interface2] vrrp vrid 1 priority 150
```

# Create VRRP group 2.

```
[LSW-A-Vlan-interface2] vrrp vrid 2 virtual-ip 202.38.160.112
```

- Configure Switch B.

# Configure VLAN 2.

```
<LSW-B> system-view
[LSW-B] vlan 2
[LSW-B-vlan2] port Ethernet1/0/6
[LSW-B-vlan2] quit
[LSW-B] interface Vlan-interface 2
[LSW-B-Vlan-interface2] ip address 202.38.160.2 255.255.255.0
```

# Create VRRP group 1.

```
[LSW-B-Vlan-interface2] vrrp vrid 1 virtual-ip 202.38.160.111
```

# Create VRRP group 2.

```
[LSW-B-Vlan-interface2] vrrp vrid 2 virtual-ip 202.38.160.112
```

# Set the priority of Switch B in VRRP group 2 to 110.

```
[LSW-B-Vlan-interface2] vrrp vrid 2 priority 110
```

Complete Configuration

- Configurations on Switch A

```
#
interface Vlan-interface2
ip address 202.38.160.1 255.255.255.0
vrrp vrid 1 virtual-ip 202.38.160.111
vrrp vrid 1 priority 150
vrrp vrid 2 virtual-ip 202.38.160.112
#
interface Ethernet1/0/6
port access vlan 2
#
```

- Configurations on Switch B

```
#
interface Vlan-interface2
```

```
ip address 202.38.160.2 255.255.255.0
vrrp vrid 1 virtual-ip 202.38.160.111
vrrp vrid 2 virtual-ip 202.38.160.112
vrrp vrid 2 priority 110
#
interface Ethernet1/0/6
port access vlan 2
#
```

Precautions

- The Switch 5500 supports VRRP, while the Switch 4500 does not.
- For the IP address owner, its priority in the VRRP group is always 255.
- Multiple-VRRP group configuration is commonly used in real networking, for multiple VRRP groups can implement load sharing.
- Do not configure multiple VRRP groups on the same VLAN interface. Otherwise, the VRRP function will be affected.
- If both switches in the preemptive mode and switches in the non-preemptive mode exist in a VRRP group, the working mode of the VRRP group conforms to that of the master. For example, if the master works in the preemptive mode, when it fails, the VRRP group will elect a new master through preemption although there are switches working in the non-preemptive mode.

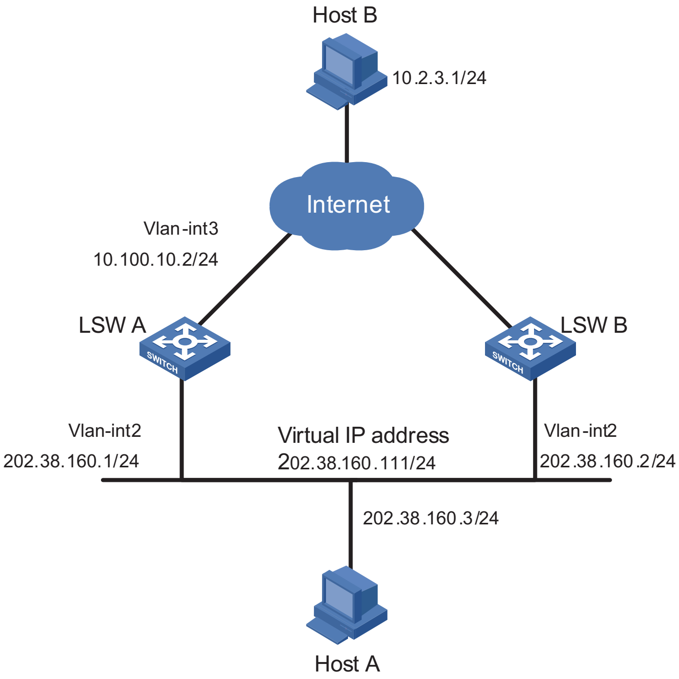
VRRP Interface Tracking

VRRP interface tracking extends the backup functionality of a backup in a VRRP group. With this function enabled, a backup can backup the master not only when the VRRP group resident interface fails, but also when other interfaces of the master become unavailable. This is achieved by tracking an interface of a master.

When the tracked interface goes down, the priority of the master decreases by a specified value (*value-reduced*), allowing a higher priority switch in the VRRP group to become the new master.

Network Diagram

Figure 51 Network diagram for VRRP



Networking and Configuration Requirements

Switch A is the master and Switch B is the backup in a VRRP group. Both Switch A and Switch B have an interface connected with the Internet. Configure the VRRP interface tracking function, so that when the interface connected with the Internet on Switch A becomes unavailable, Switch B can replace Switch A to act as the gateway even if Switch A is still working.

Set the group number to 1.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions

Configuration Procedure

- Configure Switch A.

# Configure VLAN 2.

```
<LSW-A> system-view
[LSW-A] vlan 2
[LSW-A-vlan2] port Ethernet1/0/6
[LSW-A-vlan2] quit
[LSW-A] interface Vlan-interface 2
[LSW-A-Vlan-interface2] ip address 202.38.160.1 255.255.255.0
[LSW-A-Vlan-interface2] quit
```

# Enable the VRRP group to respond to ping operations destined for its virtual IP address.

```
[LSW-A] vrrp ping-enable
```

# Create VRRP group 1.

```
[LSW-A] interface Vlan-interface 2
[LSW-A-Vlan-interface2] vrrp vrid 1 virtual-ip 202.38.160.111
```

# Set the priority of Switch A in VRRP group 1 to 110.

```
[LSW-A-Vlan-interface2] vrrp vrid 1 priority 110
```

# Set the interface to be tracked.

```
[LSW-A-Vlan-interface2] vrrp vrid 1 track interface Vlan-interface 3
 reduced 30
```

- Configure Switch B.

# Configure VLAN 2.

```
<LSW-B> system-view
[LSW-B] vlan 2
[LSW-B-vlan2] port Ethernet1/0/5
[LSW-B-vlan2] quit
[LSW-B] interface Vlan-interface 2
[LSW-B-Vlan-interface2] ip address 202.38.160.2 255.255.255.0
[LSW-B-Vlan-interface2] quit
```

# Enable a VRRP group to respond to ping operations destined for its virtual IP address.

```
[LSW-B] vrrp ping-enable
```

# Create VRRP group 1.

```
[LSW-B] interface Vlan-interface 2
[LSW-B-Vlan-interface2] vrrp vrid 1 virtual-ip 202.38.160.111
```

Normally, Switch A acts as the gateway. When VLAN-interface 3 on Switch A becomes unavailable, the priority of Switch A decreases by 30, making the priority of Switch A lower than that of Switch B. Therefore, Switch B preempts and becomes the master to act as the gateway.

When VLAN-interface 3 resumes to work, Switch A becomes the master again to act as the gateway.

Complete Configuration

- Configuration on Switch A

```
#
vrrp ping-enable
#
interface Vlan-interface2
ip address 202.38.160.1 255.255.255.0
vrrp vrid 1 virtual-ip 202.38.160.111
vrrp vrid 1 priority 110
vrrp vrid 1 track Vlan-interface1 reduced 30
#
interface Ethernet1/0/6
```

```
port access vlan 2
#
```

- Configurations on Switch B

```
#
vrrp ping-enable
#
interface Vlan-interface2
ip address 202.38.160.2 255.255.255.0
vrrp vrid 1 virtual-ip 202.38.160.111
#
interface Ethernet1/0/5
port access vlan 2
#
```

Precautions

- The Switch 5500 supports VRRP, while the Switch 4500 does not.
- For the IP address owner, its priority in the VRRP group is always 255.
- When configuring VRRP interface tracking, you are recommended to configure the uplink Trunk port to deny the VLAN that corresponds to the tracked interface.
- When you set the priority decrease value of the master in a VRRP group, make sure that the master has a lower priority than the backups after the decrease.

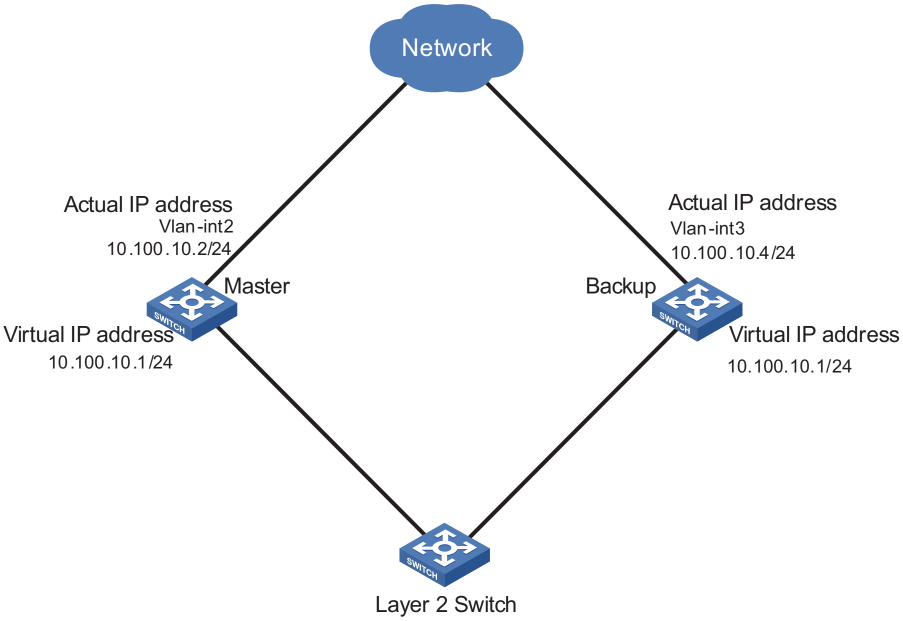
VRRP Port Tracking

VRRP group port tracking function can track the link state of a physical port, and decrease the priority of the switch when the physical port fails.

With this function enabled for a VRRP group, if the tracked physical port of the master fails, the priority of the master decreases by the specified value automatically, making a new election of the master in the group.

Network Diagram

Figure 52 Network diagram for VRRP port tracking



Networking and Configuration Requirements

- There are two switches, the master and the backup, in VRRP group 1.
- The IP addresses of the master and the backup are 10.100.10.2 and 10.100.10.3 respectively.
- The master is connected with the upstream network through port Ethernet 1/0/1 that belongs to VLAN 2, and is connected with a Layer 2 switch through Ethernet 1/0/2 that belongs to VLAN 3.
- The virtual IP address of the VRRP group is 10.100.10.1.
- Enable the port tracking function on Ethernet 1/0/1 of the master and specify that the priority of the master decreases by 50 when Ethernet 1/0/1 fails, which triggers a new master election in VRRP group 1.
- On the backup, the configurations related to the upstream and downstream device connection, and the configurations related to the VRRP group have been finished. The configuration procedures are omitted here.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions

Configuration Procedure

Perform the following configurations on the master:

# Enter system view

```
<3Com> system-view
```

# Create VLAN 2.

```
[3Com] vlan 2
[3Com-vlan2] port Ethernet1/0/1
[3Com-vlan2] quit
```

# Configure VLAN-interface 2.

```
[3Com] interface Vlan-interface 2
[3Com-Vlan-interface2] ip address 10.100.10.2 255.255.255.0
[3Com-Vlan-interface2] quit
```

# Create VLAN 3.

```
[3Com] vlan 3
[3Com-vlan3] port Ethernet1/0/2
[3Com-vlan3] quit
```

# Configure VLAN-interface 3.

```
[3Com] interface Vlan-interface 3
[3Com-Vlan-interface3] ip address 10.100.10.4 255.255.255.0
[3Com-Vlan-interface3] quit
```

# Create VRRP group 1.

```
[3Com] interface Vlan-interface 3
[3Com-Vlan-interface3] vrrp vrid 1 virtual-ip 10.100.10.1
```

# Enter port view of Ethernet 1/0/1 and enable the VRRP port tracking function.

```
[3Com] interface Ethernet1/0/1
[3Com-Ethernet1/0/1] vrrp Vlan-interface 3 vrid 1 track reduced 50
```

Complete Configuration

On the master:

```
#
interface Vlan-interface2
ip address 10.100.10.2 255.255.255.0
vrrp vrid 1 virtual-ip 10.100.10.1
#
interface Vlan-interface3
ip address 10.100.10.4 255.255.255.0
#
interface Ethernet1/0/1
 port access vlan 2
 vrrp vlan-interface 3 vrid 1 track reduced 50
#
interface Ethernet1/0/2
 port access vlan 3
#
```

Precautions

- The Switch 5500 supports VRRP, while the Switch 4500 does not.
- For the IP address owner, its priority in the VRRP group is always 255.
- When you set the priority decrease value of the master in a VRRP group, make sure that the master has a lower priority than the backups after the decrease.

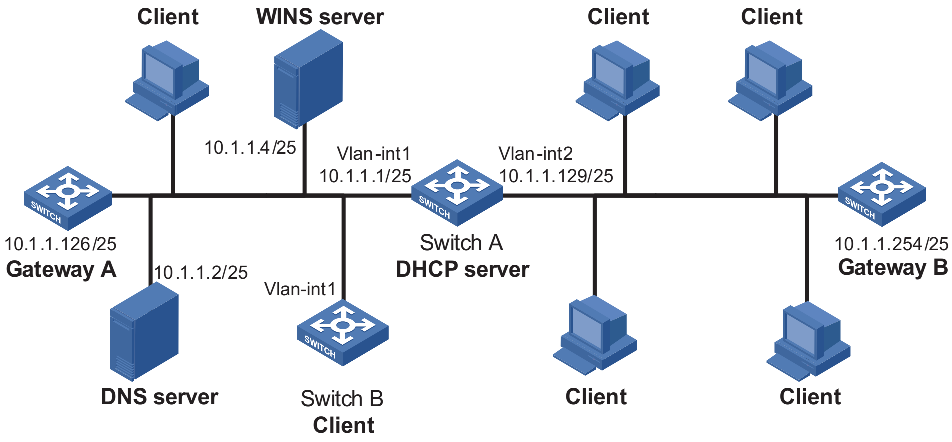
21 DHCP CONFIGURATION GUIDE

DHCP Server Global Address Pool Configuration Guide

In general, there are two typical DHCP network topologies. One is to deploy the DHCP server and DHCP clients in the same network segment. This enables the clients to communicate with the server directly. The other is to deploy the DHCP server and DHCP clients in different network segments. In this case, IP address assignment is carried out through a DHCP relay agent. Note that the DHCP server configuration is the same in both scenarios.

Network Diagram

Figure 53 Network diagram for DHCP server global address pool configuration



Networking and Configuration Requirements

- The DHCP server (Switch A) assigns IP addresses to clients in subnet 10.1.1.0/24, which is subnetted into 10.1.1.0/25 and 10.1.1.128/25.
- The IP addresses of VLAN-interface 1 and VLAN-interface 2 on Switch A are 10.1.1.1/25 and 10.1.1.129/25 respectively.
- In the address pool 10.1.1.0/25, the address lease duration is ten days and twelve hours, the domain name suffix is aabbcc.com, the DNS server address is 10.1.1.2, the WINS server address is 10.1.1.4, and the gateway address is 10.1.1.126.
- In the address pool 10.1.1.128/25, the address lease duration is five days, the domain name suffix is aabbcc.com, the DNS server address is 10.1.1.2, and the gateway address is 10.1.1.254; there is no WINS server address.
- Enable unauthorized DHCP server detection on Switch A so that the administrator can check out any unauthorized DHCP servers from the system log information.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions

Configuration Procedure

Enable DHCP.

```
[SwitchA] dhcp enable
```

# Exclude the IP addresses of the DNS server, WINS server, and gateways from dynamic assignment.

```
[SwitchA] dhcp server forbidden-ip 10.1.1.2
[SwitchA] dhcp server forbidden-ip 10.1.1.4
[SwitchA] dhcp server forbidden-ip 10.1.1.126
[SwitchA] dhcp server forbidden-ip 10.1.1.254
```

# Enable unauthorized DHCP server detection.

```
[SwitchA] dhcp server detect
```

# Configure the address range, domain name suffix and DNS server address in DHCP address pool 0.

```
[SwitchA] dhcp server ip-pool 0
[SwitchA-dhcp-pool-0] network 10.1.1.0 mask 255.255.255.0
[SwitchA-dhcp-pool-0] domain-name aabbcc.com
[SwitchA-dhcp-pool-0] dns-list 10.1.1.2
[SwitchA-dhcp-pool-0] quit
```

# Configure the address range, gateway address, and lease duration in DHCP address pool 1.

```
[SwitchA] dhcp server ip-pool 1
[SwitchA-dhcp-pool-1] network 10.1.1.0 mask 255.255.255.128
[SwitchA-dhcp-pool-1] gateway-list 10.1.1.126
[SwitchA-dhcp-pool-1] expired day 10 hour 12
[SwitchA-dhcp-pool-1] quit
```

# Configure the address range, lease duration, DNS server address and gateway address in DHCP address pool 2.

```
[SwitchA] dhcp server ip-pool 2
[SwitchA-dhcp-pool-2] network 10.1.1.128 mask 255.255.255.128
[SwitchA-dhcp-pool-2] expired day 5
[SwitchA-dhcp-pool-2] nbns-list 10.1.1.4
[SwitchA-dhcp-pool-2] gateway-list 10.1.1.254
[SwitchA-dhcp-pool-2] quit
```

With the unauthorized DHCP server detection enabled, Switch A will log information about all DHCP servers, including authorized ones. The administrator needs to find unauthorized DHCP servers from the system log information. If Switch A detects an unauthorized DHCP server, the following log information is recorded.

```
<SwitchA>
%Apr 10 21:34:55:782 2000 3Com DHCPS/4/DHCPS_LOCAL_SERVER:- 1 -
 Local DHCP server information(detect by server):SERVER IP = 10.1.1.
5; Sourceclient information: interface = Vlan-interface2, type = DHC
P_REQUEST, CHardAddr= 00e0-fc55-0011
```

Complete Configuration

```
#
dhcp server ip-pool 0
 network 10.1.1.0 mask 255.255.255.0
 dns-list 10.1.1.2
 domain-name aabbcc.com
#
dhcp server ip-pool 1
 network 10.1.1.0 mask 255.255.255.128
 gateway-list 10.1.1.126
 expired day 10 hour 12
#
dhcp server ip-pool 2
 network 10.1.1.128 mask 255.255.255.128
 gateway-list 10.1.1.254
 nbns-list 10.1.1.4
 expired day 5
#
 dhcp server forbidden-ip 10.1.1.2
 dhcp server forbidden-ip 10.1.1.4
 dhcp server forbidden-ip 10.1.1.126
 dhcp server forbidden-ip 10.1.1.254
 dhcp server detect
#
```

Precautions

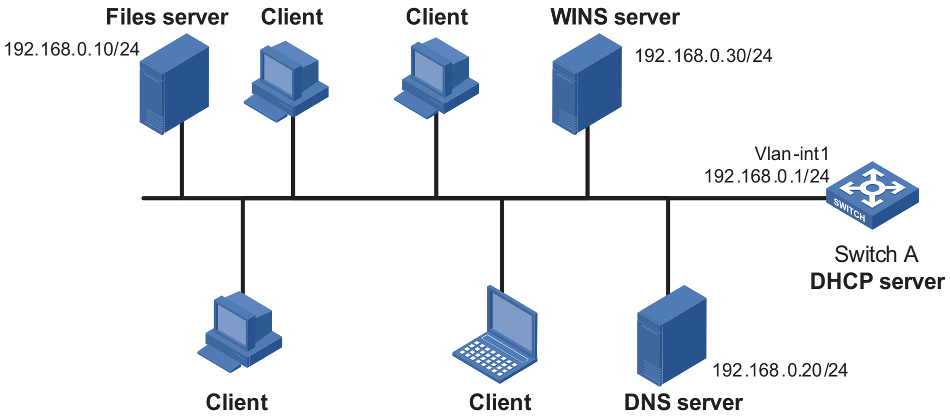
If you use the inheritance relation between the parent and child address pools in this configuration, make sure that the number of IP addresses to be assigned from a child address pool does not exceed the number of its total available addresses; otherwise, extra IP addresses will be obtained from the parent address pool, and the attributes (for example, gateway) of the parent address pool are also obtained by the clients.

In this example, the number of clients requesting IP addresses from VLAN-interface 1 is recommended to be less than or equal to 122 and the number of clients requesting IP addresses from VLAN-interface 2 is recommended to be less than or equal to 124.

DHCP Server Interface Address Pool Configuration Guide

Network Diagram

Figure 54 Network diagram for DHCP server interface address pool configuration



Networking and Configuration Requirements

- Configure the IP address of VLAN-interface 1 on the DHCP server (Switch A) as 192.168.0.1/24.
- The DHCP clients belong to VLAN 1 and dynamically obtain IP addresses through DHCP.
- The DHCP server assigns a fixed IP address of 192.168.0.10/24 from the interface address pool to the file server with MAC address 000D-88F7-0001, and assigns IP addresses on the network segment 192.168.0.0/24 to other clients with the lease duration of 10 days. The IP address of the DNS server is 192.168.0.20/24, and that of the WINS server is 192.168.0.30/24.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions

Configuration Procedure

Enable DHCP.

```
[SwitchA] dhcp enable
```

# Exclude the IP addresses of the DNS server, WINS server, and file server from dynamic assignment.

```
[SwitchA] dhcp server forbidden-ip 192.168.0.10
[SwitchA] dhcp server forbidden-ip 192.168.0.20
[SwitchA] dhcp server forbidden-ip 192.168.0.30
```

# Configure the IP address of VLAN-interface 1 as 192.168.0.1/24.

```
[SwitchA] interface Vlan-interface 1
[SwitchA-Vlan-interface1] ip address 192.168.0.1 24
```

# Configure VLAN-interface 1 to operate in DHCP interface address pool mode.

```
[SwitchA-Vlan-interface1] dhcp select interface
```

# Configure a static IP-to-MAC binding in the DHCP interface address pool.

```
[SwitchA-Vlan-interface1] dhcp server static-bind ip-address 192.168
.0.10 mac-address 000D-88F7-0001
```

# Specify the lease duration, DNS server address, and WINS server address in the DHCP interface address pool.

```
[SwitchA-Vlan-interface1] dhcp server expired day 10
[SwitchA-Vlan-interface1] dhcp server dns-list 192.168.0.20
[SwitchA-Vlan-interface1] dhcp server nbns-list 192.168.0.30
[SwitchA-Vlan-interface1] quit
```

Complete Configuration

```
#
interface Vlan-interface1
 ip address 192.168.0.1 255.255.255.0
 dhcp select interface
 dhcp server static-bind ip-address 192.168.1.10 mac-address 000d-88
f7-0001
 dhcp server dns-list 192.168.0.20
 dhcp server nbns-list 192.168.0.30
 dhcp server expired day 10
#
 dhcp server forbidden-ip 192.168.0.10
 dhcp server forbidden-ip 192.168.0.20
 dhcp server forbidden-ip 192.168.0.30
#
```

Precautions

After all the addresses in the interface address pool have been assigned, the DHCP server looks up IP addresses from the global address pool containing the network segment of the interface address pool for the DHCP clients. As a result, the IP addresses obtained from the global address pool and those obtained from the interface address pool are not on the same network segment, so the clients cannot communicate with each other.

In this example, the number of clients requesting IP addresses from VLAN-interface 1 is recommended to be less than or equal to 250.

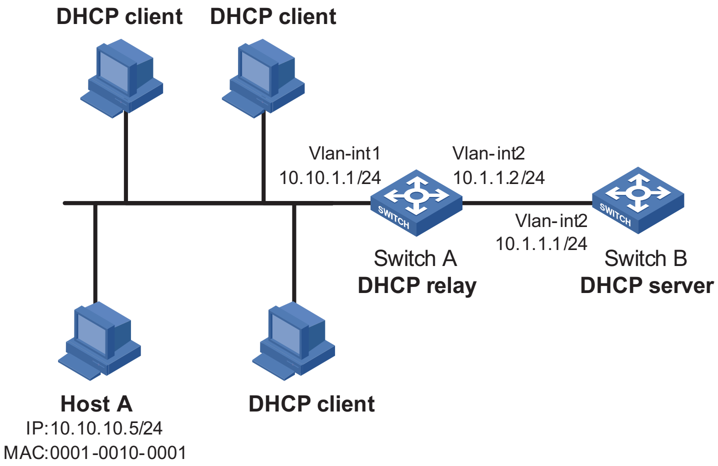
DHCP Relay Agent Configuration Guide

Since some DHCP packets are broadcast, DHCP is only applicable to the situation where DHCP clients and the DHCP server are in the same network segment, that is, you need to deploy at least one DHCP server for each network segment, which is not economical.

DHCP relay agent is designed to address this problem. It enables DHCP clients in a subnet to communicate with the DHCP server in another subnet to obtain IP addresses. In this way, the DHCP clients in multiple networks can use the same DHCP server, which is cost-effective and allows for centralized management.

Network Diagram

Figure 55 Network diagram for DHCP relay agent configuration



Networking and Configuration Requirements

- VLAN-interface 1 on the DHCP relay agent (Switch A) connects to the network where DHCP clients reside. The IP address of VLAN-interface 1 is 10.10.1.1/24 and the IP address of VLAN-interface 2 is 10.1.1.2/24.
- The clients (except Host A, which uses a fixed IP address of 10.10.10.5/24) dynamically obtain IP addresses from the DHCP server at 10.1.1.1/24.
- Switch A forwards messages between DHCP clients and the DHCP server to assign IP addresses in subnet 10.10.1.0/24 and related configuration information to the clients.
- Enable the address check function on Switch A to allow only the clients with valid fixed IP addresses or with IP addresses obtained from the DHCP server to access external networks.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

Create DHCP server group 1 and specify DHCP server 10.1.1.1 for it.

```
[SwitchA] dhcp-server 1 ip 10.1.1.1
```

# Configure the IP address of VLAN-interface 1 as 10.10.1.1/24.

```
[SwitchA] interface Vlan-interface 1
[SwitchA-Vlan-interface1] ip address 10.10.1.1 24
```

# Map VLAN-interface 1 to DHCP server group 1.

```
[SwitchA-Vlan-interface1] dhcp-server 1
[SwitchA-Vlan-interface1] quit
```

# Bind the IP address 10.10.10.5/24 to the MAC address 0001-0010-0001 of Host A on the DHCP relay agent.

```
[SwitchA] dhcp-security static 10.10.10.5 0001-0010-0001
```

# Enable the address check function on the DHCP relay agent.

```
[SwitchA] interface Vlan-interface 1
[SwitchA-Vlan-interface1] address-check enable
```

Currently, a Switch 4500 operating as a DHCP relay agent does not support the address check function.

Complete Configuration

```
#
 dhcp-server 1 ip  10.1.1.1
#
 dhcp-security static 10.10.10.5 0001-0010-0001
#
interface Vlan-interface1
 ip address 10.10.1.1 255.255.255.0
 dhcp-server 1
 address-check enable
#
```

Precautions

- You need to perform corresponding configurations on the DHCP server to enable the DHCP clients to obtain IP addresses from the DHCP server. For DHCP server configuration information, refer to the “DHCP Server Global Address Pool Configuration Guide” on page 195.
- The DHCP relay agent and server are reachable to each other.

DHCP Snooping Configuration Guide

For security, a network administrator needs to use the mappings between DHCP clients’ IP addresses obtained from the DHCP server and their MAC addresses. DHCP snooping is used to record such mappings from:

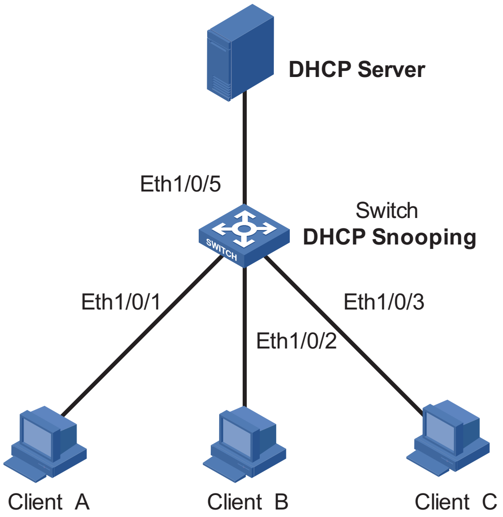
- DHCP-ACK packets
- DHCP-REQUEST packets

If there is an unauthorized DHCP server on a network, the DHCP clients may obtain invalid IP addresses. With DHCP snooping, the ports of a device can be configured as trusted or untrusted to ensure the clients to obtain IP addresses from authorized DHCP servers.

- Trusted: A trusted port is connected to an authorized DHCP server directly or indirectly. It forwards DHCP messages normally to guarantee that DHCP clients can obtain valid IP addresses.
- Untrusted: An untrusted port is connected to an unauthorized DHCP server. The DHCP-ACK or DHCP-OFFER packets received on the port are discarded to prevent DHCP clients from receiving invalid IP addresses.

Network Diagram

Figure 56 Network diagram for DHCP snooping configuration



Networking and Configuration Requirements

As shown in Figure 56, Ethernet 1/0/5 of Switch is connected to the DHCP server, and Ethernet 1/0/1, Ethernet 1/0/2, and Ethernet 1/0/3 are respectively connected to Client A, Client B, and Client C.

- Enable DHCP snooping on Switch.
- Specify Ethernet 1/0/5 on Switch as a DHCP snooping trusted port.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4210		All versions

Note that: Switch 4210support DHCP snooping, but do not support DHCP snooping trusted port configuration.

Configuration Procedure

Enable DHCP snooping on the switch.

```
[Switch] dhcp-snooping
```

# Specify Ethernet 1/0/5 as a trusted port.

```
[Switch] interface Ethernet1/0/5
[Switch-Ethernet1/0/5] dhcp-snooping trust
[Switch-Ethernet1/0/5] quit
```

Complete Configuration

```
#
interface Ethernet1/0/5
 dhcp-snooping trust
#
 dhcp-snooping
#
```

Precautions

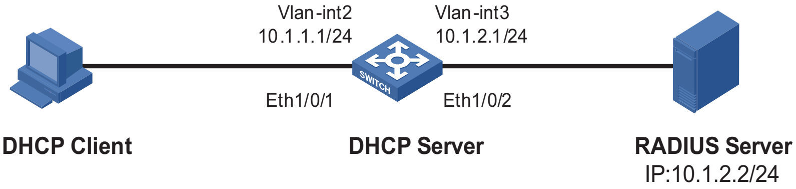
- You need to specify the port connected to the authorized DHCP server as a trusted port to ensure that DHCP clients can obtain valid IP addresses. The trusted port and the ports connected to the DHCP clients must be in the same VLAN.
- To enable DHCP snooping on a Switch 5500 that belongs to an XRN fabric, you need to set the fabric ports on all devices in the fabric to DHCP snooping trusted ports to ensure that the clients connected to each device can obtain IP addresses.
- You are not recommended to configure both the DHCP client/BOOTP client and DHCP snooping on the same device; otherwise, the switch may fail to record DHCP snooping entries.

DHCP Accounting Configuration Guide

DHCP accounting allows a DHCP server to notify the RADIUS server of the start/end of accounting when it assigns/releases a lease. The cooperation of the DHCP server and RADIUS server implements the network accounting function and ensures network security at the same time.

Network Diagram

Figure 57 Network diagram for DHCP accounting configuration



Networking and Configuration Requirements

- The DHCP server connects to a DHCP client and a RADIUS server through Ethernet 1/0/1 and Ethernet 1/0/2 respectively.
- Ethernet 1/0/1 belongs to VLAN 2; Ethernet 1/0/2 belongs to VLAN 3.
- The IP address of VLAN-interface 2 is 10.1.1.1/24, that of VLAN-interface 3 is 10.1.2.1/24, and that of the RADIUS server is 10.1.2.2/24.
- DHCP accounting is enabled on the DHCP server.
- The global DHCP address pool belongs to the network segment 10.1.1.0. The DHCP server operates as a RADIUS client and adopts AAA for authentication.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions

Configuration Procedure

Create VLAN 2.

```
[3Com] vlan 2
[3Com-vlan2] quit
```

# Create VLAN 3.

```
[3Com] vlan 3
[3Com-vlan3] quit
```

# Enter Ethernet 1/0/1 view and add the port to VLAN 2.

```
[3Com] interface Ethernet 1/0/1
[3Com-Ethernet1/0/1] port access vlan 2
[3Com-Ethernet1/0/1] quit
```

# Enter Ethernet 1/0/2 view and add the port to VLAN 3.

```
[3Com] interface Ethernet 1/0/2
[3Com-Ethernet1/0/2] port access vlan 3
[3Com-Ethernet1/0/2] quit
```

# Enter VLAN-interface 2 view and assign the IP address 10.1.1.1/24 to the VLAN interface.

```
[3Com] interface Vlan-interface 2
[3Com-Vlan-interface2] ip address 10.1.1.1 24
[3Com-Vlan-interface2] quit
```

# Enter VLAN-interface 3 view and assign the IP address 10.1.2.1/24 to the VLAN interface.

```
[3Com] interface Vlan-interface 3
[3Com-Vlan-interface3] ip address 10.1.2.1 24
[3Com-Vlan-interface3] quit
```

# Create a RADIUS scheme and a domain, and then associate the domain with the RADIUS scheme.

```
[3Com] radius scheme 123
[3Com-radius-123] primary authentication 10.1.2.2
[3Com-radius-123] primary accounting 10.1.2.2
[3Com-radius-123] quit
[3Com] domain 123
[3Com-isp-123] scheme radius-scheme 123
[3Com-isp-123] quit
```

# Create an address pool on the DHCP server.

```
[3Com] dhcp server ip-pool test
[3Com-dhcp-pool-test] network 10.1.1.0 mask 255.255.255.0
```

# Enable DHCP accounting.

```
[3Com-dhcp-pool-test] accounting domain 123
```

Complete Configuration

```
#
radius scheme 123
 primary authentication 10.1.2.2
 primary accounting 10.1.2.2
#
domain 123
 scheme radius-scheme 123
#
dhcp server ip-pool test
 network 10.1.1.0 mask 255.255.255.0
 accounting  domain 123
```

```
#
vlan 2
#
vlan 3
#
interface Vlan-interface2
 ip address 10.1.1.1 255.255.255.0
#
interface Vlan-interface3
 ip address 10.1.2.1 255.255.255.0
#
interface Ethernet1/0/1
 port access vlan 2
#
interface Ethernet1/0/2
 port access vlan 3
#
```

Precautions

Before configuring DHCP accounting, make sure that:

- The DHCP server is configured (such as the address pool, lease time and other configuration parameters).
- The DHCP client is enabled.
- Routes are reachable.

DHCP Client Configuration Guide

With the DHCP client enabled on an interface, the interface will use DHCP to obtain configuration parameters such as an IP address from the DHCP server.

Network Diagram

Refer to Figure 53.

Networking and Configuration Requirements

Configure VLAN-interface 1 on Switch B to obtain an IP address through DHCP.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

Create VLAN-interface 1 on Switch B and enter its view.

```
[SwitchB] interface Vlan-interface 1
```

# Configure VLAN-interface 1 to obtain an IP address through DHCP.

```
[SwitchB-Vlan-interface1] ip address dhcp-alloc
[SwitchB-Vlan-interface1] quit
```

Complete Configuration

```
#
interface Vlan-interface1
 ip address dhcp-alloc
#
```

Precautions

None

22 ACL Configuration Guide

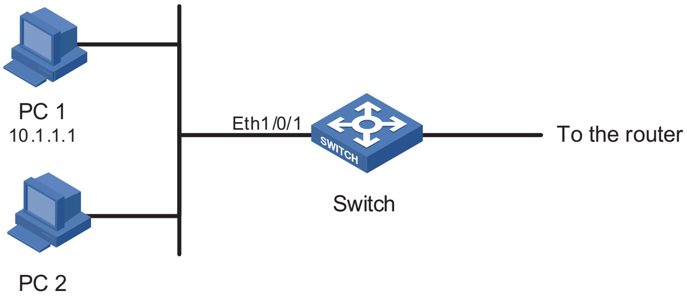
Configuring Basic ACLs

Basic ACLs filter packets based on only source IP address.

The numbers of basic ACLs range from 2000 to 2999.

Network Diagram

Figure 58 Network diagram for basic ACL configuration



Networking and Configuration Requirements

PC 1 and PC 2 connect to the switch through Ethernet 1/0/1 (assuming that the switch is a Switch 5500). PC 1's IP address is 10.1.1.1. Apply an ACL on Ethernet 1/0/1 to deny packets with the source IP address of 10.1.1.1 from 8:00 to 18:00 everyday.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

Define a periodic time range that is from 8:00 to 18:00 everyday.

```
<3Com> system-view
[3Com] time-range test 8:00 to 18:00 daily
```

# Define basic ACL 2000 to filter packets with the source IP address of 10.1.1.1.

```
[3Com] acl number 2000
[3Com-acl-basic-2000] rule 1 deny source 10.1.1.1 0 time-range test
[3Com-acl-basic-2000] quit
```

# Apply ACL 2000 to Ethernet 1/0/1.

```
[3Com] interface Ethernet 1/0/1
[3Com-Ethernet1/0/1] packet-filter inbound ip-group 2000
```

Complete Configuration

```
#
acl number 2000
 rule 1 deny source 10.1.1.1 0 time-range test
#
interface Ethernet1/0/1
 packet-filter inbound ip-group 2000 rule 1
#
 time-range test 08:00 to 18:00 daily
#
```

Precautions

- If a packet matches multiple ACL rules at the same time and some actions of the rules conflict, the last assigned rule takes effective.
- When applying multiple rules, you are recommended to apply rules in the ascending order of their mask ranges and apply rues with the same mask range at the same time. This is to ensure that the actual operation of the rules is consistent with the requirements.
- Some functions and protocols configured on the device may occupy ACL rule resources. The actual occupation varies with functions and protocols.

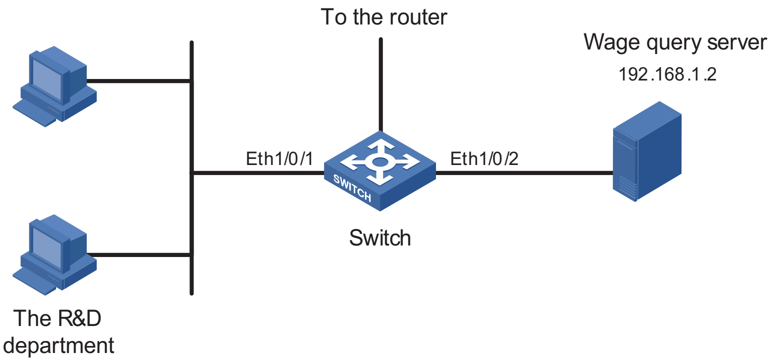
Configuring Advanced ACLs

Advanced ACLs filter packets based on Layer 3 and Layer 4 header information such as the source and destination IP addresses, type of the protocols carried by IP, protocol-specific features (such as TCP or UDP source port and destination port, ICMP message type and message code).

The numbers of advanced ACLs range from 3000 to 3999.

Network Diagram

Figure 59 Network diagram for advanced ACL configuration



Networking and Configuration Requirements

Different departments of an enterprise are interconnected through a switch (assuming that the switch is a Switch 5500).The IP address of the wage query server is 192.168.1.2. The R&D department is connected to Ethernet 1/0/1 of the switch. Apply an advanced ACL on the interface to deny access requests that are sourced from the R&D department and destined for the wage server during working hours (8:00 to 18:00).

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions

Product series	Software version	Hardware version
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

Define a periodic time range that is from 8:00 to 18:00 on working days.

```
<3Com> system-view
[3Com] time-range test 8:00 to 18:00 working-day
```

# Define advanced ACL 3000 to filter packets destined for the wage query server.

```
[3Com] acl number 3000
[3Com-acl-adv-3000] rule 1 deny ip destination 192.168.1.2 0 time-range test
[3Com-acl-adv-3000] quit
```

# Apply ACL 3000 to Ethernet 1/0/1.

```
[3Com] interface Ethernet 1/0/1
[3Com-Ethernet1/0/1] packet-filter inbound ip-group 3000
```

Complete Configuration

```
#
acl number 3000
 rule 1 deny IP destination 192.168.1.2 0 time-range test
#
interface Ethernet1/0/1
 packet-filter inbound ip-group 3000 rule 1
#
 time-range test 08:00 to 18:00 working-day
#
```

Precautions

- ACL 3998 and ACL 3999 are reserved for cluster management.
- If a packet matches multiple ACL rules at the same time and some actions of the rules conflict, the last assigned rule takes effective.
- For an advanced ACL applied to a port, if a rule defines the TCP/UDP port information, the *operator* argument can only be **eq**.
- When applying multiple rules, you are recommended to apply rules in the ascending order of their mask ranges and apply rues with the same mask range at the same time. This is to ensure that the actual operation of the rules is consistent with the requirements.
- Some functions and protocols configured on the device may occupy ACL rule resources. The actual occupation varies with functions and protocols.

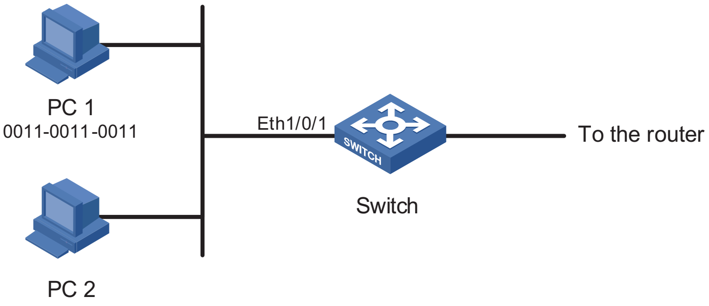
Configuring Ethernet Frame Header ACLs

Ethernet frame header ACLs filter packets based on Layer 2 header information such as source and destination MAC addresses, 802.1p priority and type of the Layer 2 protocol.

The numbers of Ethernet frame header ACLs range from 4000 to 4999.

Network Diagram

Figure 60 Network diagram for Ethernet frame header ACL configuration



Networking and Configuration Requirements

PC 1 and PC 2 connect to the switch through Ethernet 1/0/1 (assuming that the switch is a Switch 5500). PC 1's MAC address is 0011-0011-0011. Apply an Ethernet frame header ACL on the interface to filter packets with the source MAC address of 0011-0011-0011 and the destination MAC address of 0011-0011-0012 from 8:00 to 18:00 everyday.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

Define a periodic time range that is from 8:00 to 18:00 everyday.

```
<3Com> system-view
[3Com] time-range test 8:00 to 18:00 daily
```

# Define ACL 4000 to filter packets with the source MAC address of 0011-0011-0011 and the destination MAC address of 0011-0011-0012.

```
[3Com] acl number 4000
[3Com-acl-ethernetframe-4000] rule 1 deny source 0011-0011-0011 ffff
-ffff-ffff dest 0011-0011-0012 ffff-ffff-ffff time-range test
[3Com-acl-ethernetframe-4000] quit
```

# Apply ACL 4000 to Ethernet 1/0/1.

```
[3Com] interface Ethernet 1/0/1
[3Com-Ethernet1/0/1] packet-filter inbound link-group 4000
```

Complete Configuration

```
#
acl number 4000
 rule 1 deny source 0011-0011-0011 ffff-ffff-ffff dest 0011-0011-001
2 ffff-ffff-ffff time-range test
#
interface Ethernet1/0/1
 packet-filter inbound link-group 4000 rule 1
#
 time-range test 08:00 to 18:00 daily
#
```

Precautions

- If a packet matches multiple ACL rules at the same time and some actions of the rules conflict, the last assigned rule takes effective. For an Ethernet frame header ACL applied to a port, you cannot configure the *format-type* argument as 802.3/802.2, 802.3, ether_ii or snap.
- When applying multiple rules, you are recommended to apply rules in the ascending order of their mask ranges and apply rues with the same mask range at the same time. This is to ensure that the actual operation of the rules is consistent with the requirements.
- Some functions and protocols configured on the device may occupy ACL rule resources. The actual occupation varies with functions and protocols.

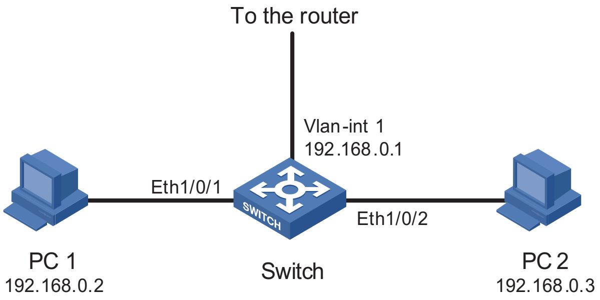
Configuring User-Defined ACLs

A user-defined ACL filters packets by comparing the strings retrieved from the packets with specified strings. It defines the byte it begins to perform the "and" operation with the mask on the basis of packet headers.

The numbers of user-defined ACLs range from 5000 to 5999.

Network Diagram

Figure 61 Network diagram for user-defined ACL configuration



Networking and Configuration Requirements

PC 1 and PC 2 are connected to the switch through Ethernet 1/0/1 and Ethernet 1/0/2 respectively (assuming that the switch is a Switch 5500). The IP addresses of PC 1 and PC 2 are 192.168.0.2 and 192.168.0.3.

PC 1 and PC 2 belong to VLAN 1 and access the Internet through the same gateway, which has an IP address of 192.168.0.1 (the IP address of VLAN-interface 1).

Configure a user-defined ACL to deny all ARP packets from PC 1 that use the gateway IP address as the source address from 8:00 to 18:00 everyday.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

Define a periodic time range that is from 8:00 to 18:00 everyday.

```
<3Com> system-view
[3Com] time-range test 8:00 to 18:00 daily
```

# Define ACL 5000 to deny any ARP packet whose source IP address is 192.168.0.1 from 8:00 to 18:00 everyday (provided that VLAN-VPN is not enabled on any port).In the ACL rule, 0806 is the ARP protocol number, 16 is the protocol type field offset of the internally processed Ethernet frame, c0a80001 is the hexadecimal form of 192.168.0.1, and 32 is the source IP address field offset of the internally processed ARP packet.

```
[3Com] acl number 5000
[3Com-acl-user-5000] rule 1 deny 0806 ffff 16 c0a80001 ffffffff 32 t
ime-range test
```

# Apply ACL 5000 to Ethernet 1/0/1.

```
[3Com] interface Ethernet 1/0/1
[3Com-Ethernet1/0/1] packet-filter inbound user-group 5000
```

Complete Configuration

```
#
acl number 5000
 rule 1 deny 0806 ffff 16 c0a80001 ffffffff 32 time-range test
#
interface Ethernet1/0/1
 packet-filter inbound user-group 5000 rule 1
#
 time-range test 08:00 to 18:00 daily
#
```

Precautions

- Some functions and protocols configured on the device may occupy ACL rule resources. The actual occupation varies with functions and protocols.
- For a Switch 5500, if VLAN-VPN is not enabled, each packet in the switch carries one VLAN tag which is 4 bytes long; If VLAN-VPN is enabled on a port, each packet in the switch carries two VLAN tags, which are 8 bytes long. Pay attention to the above information when configuring a rule that matches specific fields of packets.
- For an Switch 5500Gs Ethernet switch, each packet in the switch carries two VLAN tags, which are 8 bytes long. Pay attention to the above information when configuring a rule that matches specific fields of packets.
- The command for defining a user-defined ACL rule is **rule** [*rule-id*] { **deny** | **permit** } [*rule-string rule-mask offset*] &<1-8> [**time-range** *time-name*], where, *rule-id* refers to the ACL number, *rule-string* the user-defined rule string, *rule-mask* the user-defined rule mask, and *offset* the rule mask offset.
- If you specify multiple rule strings in an ACL rule, the valid length of the rule mask is 128 hexadecimal numerals (64 bytes).For example, assume that you specify a rule string of **aa** and set its offset to 2. If you continue to specify a rule string of **bb**, its offset must be in the range from 3 to 65 bytes. If you set the offset of the rule string **aa** to 3, the offset of the rule string **bb** must be in the range of 4 to 66 bytes, and so on. Note that the offset of the rule string **bb** cannot be greater than 79 bytes.
- As shown in Table 2, the hardware rule of the Switch 5500/5500G logically divides the rule mask offset of a user-defined string into multiple offset units, each of which is 4-byte long. Available offset units fall into eight groups, which are numbered from Offset1 to Offset8

- With the Switch 5500/5500G, for a user-defined ACL to be assigned successfully, the maximum length of a user-defined rule string is 32 bytes. The string may or may not contain spaces, and can occupy up to eight mask offset units. Besides, any two offset units cannot belong to the same offset group.

Table 2 Offset units of a user-defined rule string

Offset unit							
Offset1	**Offset2**	**Offset3**	**Offset4**	**Offset5**	**Offset6**	**Offset7**	**Offset8**
0 to 3	4 to 7	8 to 11	12 to 15	16 to 19	20 to 23	24 to 27	28 to 31
2 to 5	6 to 9	10 to 13	14 to 17	18 to 21	22 to 25	26 to 29	30 to 33
6 to 9	10 to 13	14 to 17	18 to 21	22 to 25	26 to 29	30 to 33	34 to 37
12 to 15	16 to 19	20 to 23	24 to 27	28 to 31	32 to 35	36 to 39	40 to 43
20 to 23	24 to 27	28 to 31	32 to 35	36 to 39	40 to 43	44 to 47	48 to 51
30 to 33	34 to 37	38 to 41	42 to 45	46 to 49	50 to 53	54 to 57	58 to 61
42 to 45	46 to 49	50 to 53	54 to 57	58 to 61	62 to 65	66 to 69	70 to 73
56 to 59	60 to 63	64 to 67	68 to 71	72 to 75	76 to 79	0 to 3	4 to 7

- For example, assuming that you configure ACL 5000, specifying a 32-byte rule string, a rule mask of all Fs, and an offset of 4 and then apply the ACL to Ethernet 1/0/1. In this case, the 32-byte rule string occupies eight offset units: 4 to 7 (Offset2), 8 to 11 (Offset3), 12 to 15 (Offset4), 16 to 19 (Offset5), 20 to 23 (Offset1), 24 to 27 (Offset7), 28 to 31 (Offset8), and 32 to 35 (Offset6), as shown in Table 2. The rule can be assigned successfully.
- If you configure ACL 5001, specifying a 32-byte rule string, a rule mask of all Fs, and an offset of 24 and then apply the ACL to Ethernet 1/0/1: In this case, the 32-byte rule string does not comply with the rule that a user-defined rule string can contain up to eight mask offset units and any two offset units cannot belong to the same offset. The ACL cannot be assigned.

The common protocol types and their offsets are listed in the following table.

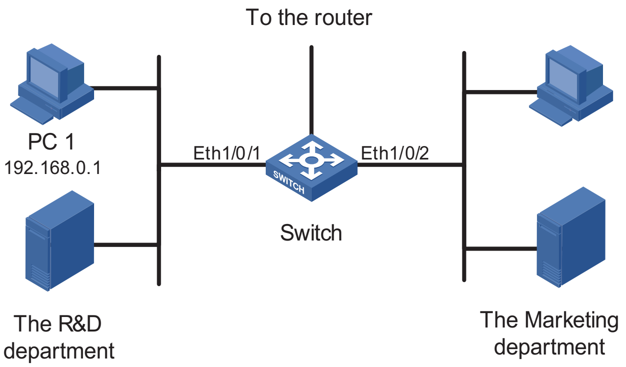
Protocol type	Protocol number (hexadecimal)	Offset for Switch 5500s with VLAN-VPN function disabled	Offset for Switch 5500s with VLAN-VPN function enabled	Offset for Switch 5500Gs
ARP	0x0806	16	20	20
RARP	0x8035	16	20	20
IP	0x0800	16	20	20
IPX	0x8137	16	20	20
AppleTalk	0x809B	16	20	20
ICMP	0x01	27	31	31
IGMP	0x02	27	31	31
TCP	0x06	27	31	31
UDP	0x17	27	31	31

23 QoS/QoS Profile Configuration Guide

Configuring Traffic Policing and LR

Network Diagram

Figure 62 Network diagram for traffic policing and LR configuration



Networking and Configuration Requirements

A company uses a switch (a Switch 5500 in this example) to interconnect all the departments. PC 1 with IP address 192.168.0.1 belongs to the R&D department and is connected to Ethernet 1/0/1 of the switch; the marketing department is connected to Ethernet 1/0/2 of the switch.

Configure traffic policing and LR to satisfy the following requirements:

- Limit the total outbound traffic rate of the marketing department and the R&D department to 16000 kbps; drop the packets exceeding the rate limit.
- Limit the rate of the IP packets that PC 1 of the R&D department sends out to 8000 kbps; drop the packets exceeding the rate limit.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

The Switch 4210 does not support traffic policing.

Configuration Procedure

1 Define traffic classification rules

# Create basic ACL 2000 and enter basic ACL view.

```
<3Com> system-view
[3Com] acl number 2000
```

# Define a rule to match the packets with source IP address 192.168.0.1.

```
[3Com-acl-basic-2000] rule permit source 192.168.0.1 0
[3Com-acl-basic-2000] quit
```

2 Configure traffic policing and LR

# Limit the total outbound traffic rate of the marketing department and the R&D department to 16000 kbps, and drop the packets exceeding the rate limit.

```
[3Com] interface Ethernet 1/0/3
[3Com-Ethernet1/0/3] line-rate outbound 16000
```

# Limit the rate of the IP packets that PC 1 of the R&D department sends out to 8000 kbps, and drop the packets exceeding the rate limit.

```
[3Com] interface Ethernet 1/0/1
[3Com-Ethernet1/0/1] traffic-limit inbound ip-group 2000 8000 exceed drop
```

Complete Configuration

```
#
acl number 2000
 rule 0 permit source 192.168.0.1 0
#
interface Ethernet1/0/1
 traffic-limit inbound ip-group 2000 rule 0 8000 exceed drop
#
interface Ethernet1/0/3
 line-rate outbound 16000
#
```

Precautions

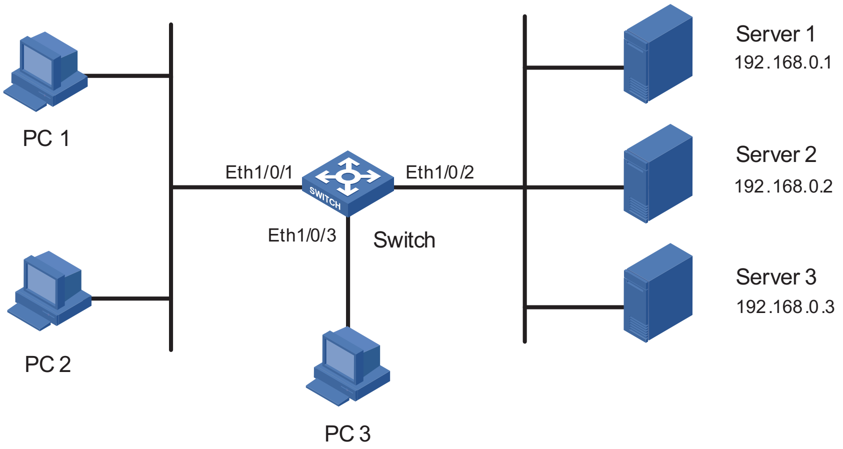
Note that:

- The ACL rules configured for traffic classification must be permit statements.
- If packets match ACL rules of multiple traffic policing actions, the traffic policing action issued the last takes effect.
- The granularity of traffic policing and LR is 64 kbps. If the value you input is in the range of N×64 to (N+1)×64 (N is a natural number), the switch sets the value to (N+1)×64 kbps automatically.
- Traffic policing or rate limiting just limits the traffic rate of payloads (excluding preambles and interframes).
- When referencing an ACL for traffic policing, you must note that the action that traffic policing takes on conforming traffic is permit. If a packet matches a permit statement and a deny statement at the same time, the one issued the last takes effect. If the deny statement takes effect, no traffic policing action will be performed on the packet.

Configuring Priority Marking and Queue Scheduling

Network Diagram

Figure 63 Network diagram for priority marking and queue scheduling configuration



Networking and Configuration Requirements

A company uses a switch (a Switch 5500 in this example) to interconnect all the departments. PC 1, PC 2, and PC 3 are clients. PC 1 and PC 2 are connected to Ethernet 1/0/1 of the switch; PC 3 is connected to Ethernet 1/0/3 of the switch. Server 1, Server 2, and Server 3 are the database server, mail server, and file server of the company. The three servers are connected to Ethernet 1/0/2 of the switch.

Configure priority marking and queue scheduling to satisfy the following requirements:

- Configure priority marking on Ethernet 1/0/1 to enable the switch to process traffic flows from PC 1 and PC 2 to the database server, mail server, and file server in the descending order.
- Trust the port priority on Ethernet 1/0/3 and set the port priority of Ethernet 1/0/3 to 5. When PC 1, PC 2, and PC 3 access servers simultaneously, the traffic from PC 3 is preferentially processed.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

The Switch 4210do not support priority marking.

Configuration Procedure

1 Define traffic classification rules

# Create advanced ACL 3000 and enter advanced ACL view.

```
<3Com> system-view
[3Com] acl number 3000
```

# Define traffic classification rules with destination IP address as the match criterion.

```
[3Com-acl-adv-3000] rule 0 permit ip destination 192.168.0.1 0
[3Com-acl-adv-3000] rule 1 permit ip destination 192.168.0.2 0
[3Com-acl-adv-3000] rule 2 permit ip destination 192.168.0.3 0
[3Com-acl-adv-3000] quit
```

2 Configure priority marking

# Mark the traffic matching ACL 3000 with a local precedence value on Ethernet 1/0/1.

```
[3Com] interface Ethernet 1/0/1
[3Com-Ethernet1/0/1] traffic-priority inbound ip-group 3000 rule 0 l
ocal-precedence 4
[3Com-Ethernet1/0/1] traffic-priority inbound ip-group 3000 rule 1 l
ocal-precedence 3
[3Com-Ethernet1/0/1] traffic-priority inbound ip-group 3000 rule 2 l
ocal-precedence 2
[3Com-Ethernet1/0/1] quit
```

3 Configure priority trust mode

# Configure the switch to trust port priority on Ethernet 1/0/3 and set the port priority of Ethernet 1/0/3 to 5. (As port priority is trusted by default, you need not to configure it here.)

```
[3Com] interface Ethernet 1/0/3
[3Com-Ethernet1/0/3] priority 5
[3Com-Ethernet1/0/3] quit
```

4 Configure a priority mapping table

# Configure the CoS-to-local precedence mapping table as follows: 0->0, 1->1, 2->2, 3->3, 4->4, 5->5, 6->6, and 7->7.

```
[3Com] qos cos-local-precedence-map 0 1 2 3 4 5 6 7
```

5 Configure queue scheduling

# Configure the switch to adopt the SP queue scheduling algorithm.

```
[3Com] queue-scheduler strict-priority
```

Complete Configuration

```
#
 qos cos-local-precedence-map 0 1 2 3 4 5 6 7
#
 queue-scheduler strict-priority
#
```

```
acl number 3000
 rule 0 permit IP destination 192.168.0.1 0
 rule 1 permit IP destination 192.168.0.2 0
 rule 2 permit IP destination 192.168.0.3 0
#
interface Ethernet1/0/1
 traffic-priority inbound ip-group 3000 rule 0 local-precedence 4
 traffic-priority inbound ip-group 3000 rule 1 local-precedence 3
 traffic-priority inbound ip-group 3000 rule 2 local-precedence 2
#
interface Ethernet1/0/3
 priority 5
#
```

Precautions

Note that:

- The ACL rules configured for traffic classification must be permit statements.
- The Switch 5500/5500Gupport marking 802.1p precedence, IP precedence, DSCP precedence, and local precedence for packets.
- The Switch 5500/5500G first map 802.1p precedence to local precedence and then perform queue scheduling for the packets based on local precedence. To avoid local precedence conflict, the devices do not support marking 802.1p precedence and local precedence simultaneously.
- On a port configured with port priority trust, the switch uses the port priority as the 802.1p precedence of received packets. If a packet carries the 802.1q tag, the port priority overrides the old 802.1p precedence in the tag.
- With the action of marking 802.1p precedence or local precedence configured on a port, the Switch 5500/5500G switch marks the conforming packets received on the port accordingly.
- On the Switch 5500/5500G, if DSCP marking is configured in both the priority marking and traffic policing functions for the same type of packets, the action issued the last takes effect.
- The Switch 5500/5500G support eight output queues and the Switch 4210 supports four.
- The Switch 5500 strict priority (SP), weighted fair queue (WFQ), and weighted round robin (WRR) for queue scheduling. In addition, you may combine SP with WRR or WFQ to implement finer queue scheduling. By default, all ports adopt WRR, and the weights of queue 0 through queue 7 are 1, 2, 3, 4, 5, 9, 13, and 15. You are recommended to use the defaults when using WRR.
- The Switch 5500Gs support the SP and WRR queue scheduling algorithms. In addition, you may combine them to implement finer queue scheduling. By default, all ports adopt WRR, and the weights of queue 0 through queue 7 are 1, 2, 3, 4, 5, 9, 13, and 15. You are recommend to use the defaults when using WRR.
- With the SP + WRR queue scheduling algorithm enabled on a port, the device preferentially schedules the queue with scheduling weight 0; when the priority queue is empty, the remaining queues are scheduled using WRR. With the SP + WFQ queue scheduling algorithm enabled on a port, the device preferentially schedules the queue with bandwidth 0; when the priority queue is empty, the remaining queues are scheduled using WFQ.

- The Switch 4210 supports the WRR queue scheduling algorithm and the high queue-WRR (HQ-WRR) queue scheduling algorithm. HQ-WRR is implemented based on WRR. HQ-WRR selects queue 3 as the high-priority queue from the four output queues. If the bandwidth occupied by the four queues exceeds the port capability, packets in queue 3 are preferentially transmitted, and the left three queues are scheduled using WRR.
- The Switch 4210, 5500, and 5500G provide the default 802.1p-to-local precedence mapping table as follows:

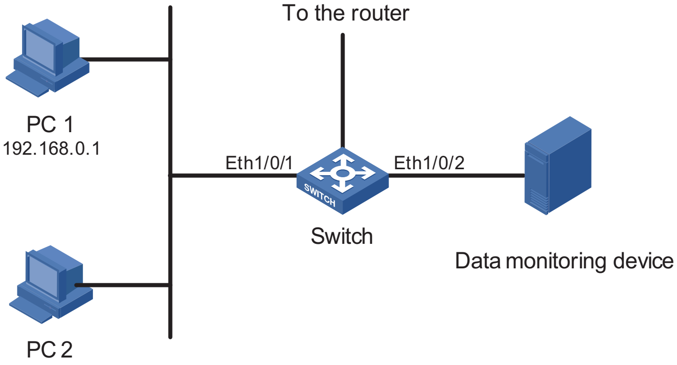
Table 3 802.1p-to-local precedence mapping table

802.1p precedence (CoS)	Local precedence
0	2
1	0
2	1
3	3
4	4
5	5
6	6
7	7

Configuring Traffic Redirection and Traffic Accounting

Network Diagram

Figure 64 Network diagram for traffic redirection and traffic accounting configuration



Networking and Configuration Requirements

A company uses a switch (a Switch 5500 in this example) to interconnect all the departments. The network is described as follows:

- PC 1 and PC 2 are connected to Ethernet 1/0/1 of the switch. The IP address of PC 1 is 192.168.0.1.
- The data monitoring device is connected to Ethernet1/0/2 of the switch.

Configure traffic redirection and traffic accounting to satisfy the following requirements:

- From 8:30 to 18:00 in working days, redirect the HTTP traffic from PC 1 to the Internet to the data monitoring device for analysis.

- During non-working time, count the HTTP traffic from PC 1 to the Internet.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

1 Define a time range for working days

# Create time range **tr1**, setting it to become active between 8:30 to 18:00 during working days.

```
<3Com> system-view
[3Com] time-range tr1 08:30 to 18:00 working-day
```

# Create time range **tr2**, setting is to become active during non-working time.

```
[3Com] time-range tr2 00:00 to 8:30 working-day
[3Com] time-range tr2 18:00 to 24:00 working-day
[3Com] time-range tr2 00:00 to 24:00 off-day
```

2 Define traffic classification rules

# Create advanced ACL 3000 and enter advanced ACL view.

```
<3Com> system-view
[3Com] acl number 3000
```

# Define traffic classification rules to classify the HTTP traffic from PC 1 to the Internet.

```
[3Com-acl-adv-3000] rule 0 permit tcp source 192.168.0.1 0 destinati
on-port eq 80 time-range tr1
[3Com-acl-adv-3000] rule 1 permit tcp source 192.168.0.1 0 destinati
on-port eq 80 time-range tr2
[3Com-acl-adv-3000] quit
```

3 Configure traffic redirection

# Redirect the traffic matching certain criteria on Ethernet 1/0/1 to Ethernet 1/0/2.

```
[3Com] interface Ethernet 1/0/1
[3Com-Ethernet1/0/1] traffic-redirect inbound ip-group 3000 rule 0 i
nterface Ethernet 1/0/2
```

4 Configure traffic accounting

# Count the traffic matching certain criteria on Ethernet 1/0/1.

```
[3Com-Ethernet1/0/1] traffic-statistic inbound ip-group 3000 rule 1
```

Complete Configuration

```
#
acl number 3000
 rule 0 permit TCP source 192.168.0.1 0 destination-port eq www time-range tr1
 rule 1 permit TCP source 192.168.0.1 0 destination-port eq www time-range tr2
#
interface Ethernet1/0/1
 traffic-redirect inbound ip-group 3000 rule 0 interface Ethernet1/0/2
 traffic-statistic inbound ip-group 3000 rule 1
#
 time-range tr2 00:00 to 08:30 working-day
 time-range tr2 18:00 to 24:00 working-day
 time-range tr2 00:00 to 24:00 off-day
 time-range tr1 08:30 to 18:00 working-day
#
```

Precautions

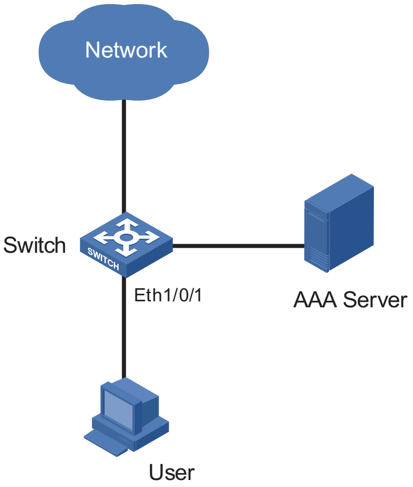
Note that:

- The ACL rules configured for traffic classification must be permit statements.
- When redirecting a packet, the switch processes the packet with the forwarding mechanism instead of leaving it intact.
- With traffic redirection configured, the switch does not forward the packets to be redirected as usual.
- The packets received on the destination port for redirection are tagged.

Configuring QoS Profile

Network Diagram

Figure 65 Network diagram for QoS profile configuration



Networking and Configuration Requirements

A company uses a switch (a Switch 5500 in this example) to interconnect all the departments. The 802.1x protocol is used to authenticate the users and control user access to the network resources. A user named **someone** in the **test.net** domain is connected to Ethernet 1/0/1 of the switch. Its password is **hello**.

Configure a QoS profile to limit the outgoing IP traffic rate of the user **someone** to 128 kbps after the user passes the 802.1x authentication, and drop the packets exceeding the rate limit.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

1 Configuration on the AAA server

Configure authentication information and user name-to-QoS-profile mapping for the user on the AAA server. Refer to “AAA Configuration” in the *Configuration Guide* for your product for detailed information.

2 Configuration on the switch

# Configure the IP address information of the RADIUS server.

```
<3Com> system-view
[3Com] radius scheme radius1
[3Com-radius-radius1] primary authentication 10.11.1.1
[3Com-radius-radius1] primary accounting 10.11.1.2
[3Com-radius-radius1] secondary authentication 10.11.1.2
[3Com-radius-radius1] secondary accounting 10.11.1.1
```

# Configure encryption keys for the switch to exchange packets with the authentication RADIUS server and the accounting RADIUS server.

```
[3Com-radius-radius1] key authentication money
[3Com-radius-radius1] key accounting money
```

# Enable the switch to remove the domain name from the fully qualified user name and then send the unqualified user name to the RADIUS sever.

```
[3Com-radius-radius1] user-name-format without-domain
[3Com-radius-radius1] quit
```

# Create the user domain **test.net** and specify **radius1** as the RADIUS server group for the domain user.

```
[3Com] domain test.net
[3Com-isp-test.net] radius-scheme radius1
[3Com-isp-test.net] quit
```

# Create advanced ACL 3000 and define a classification rule to match IP packets destined for any IP address.

```
[3Com] acl number 3000
[3Com-acl-adv-3000] rule 1 permit ip destination any
[3Com-acl-adv-3000] quit
```

# Configure a QoS profile to limit the rate of the conforming traffic to 128 kbps and drop the packets exceeding the rate limit.

```
[3Com] qos-profile example
[3Com-qos-profile-example] traffic-limit inbound ip-group 3000 128 exceed drop
```

Enable 802.1x.

```
[3Com] dot1x
[3Com] dot1x interface Ethernet 1/0/1
```

Complete Configuration

```
#
 dot1x
#
radius scheme system
radius scheme radius1
 server-type standard
 primary authentication 10.11.1.1
 primary accounting 10.11.1.2
 secondary authentication 10.11.1.2
 secondary accounting 10.11.1.1
 key authentication money
 key accounting money
 user-name-format without-domain
#
domain system
domain test.net
 scheme radius-scheme radius1
#
acl number 3000
 rule 0 permit IP
#
qos-profile example
 traffic-limit inbound ip-group 3000 rule 0 128 exceed drop
#
interface Ethernet1/0/1
 dot1x
#
```

Precautions

Note that:

- A QoS profile can be applied manually or dynamically. You can use the **apply qos-profile** *profile-name* command to manually apply a QoS profile to a port. You can also combine a QoS profile with the 802.1x authentication function to provide the pre-defined QoS function for a user or a group of users that have passed authentication.
- Depending on the 802.1x authentication mode, dynamic QoS profile application mode can be user-based or port-based. The user-based mode is the default mode.
- If the traffic classification rules of a QoS profile take source information (including source MAC, source IP, VLAN) as the match criterion, the QoS profile cannot be applied in the user-based mode.
- Currently, the QoS profile function provides packet filtering, traffic policing, and priority marking.
- The granularity of traffic policing is 64 kbps. If the value you input is in the range of N×64 to (N+1)×64 (N is a natural number), the switch sets the value to (N+1)×64 kbps automatically.

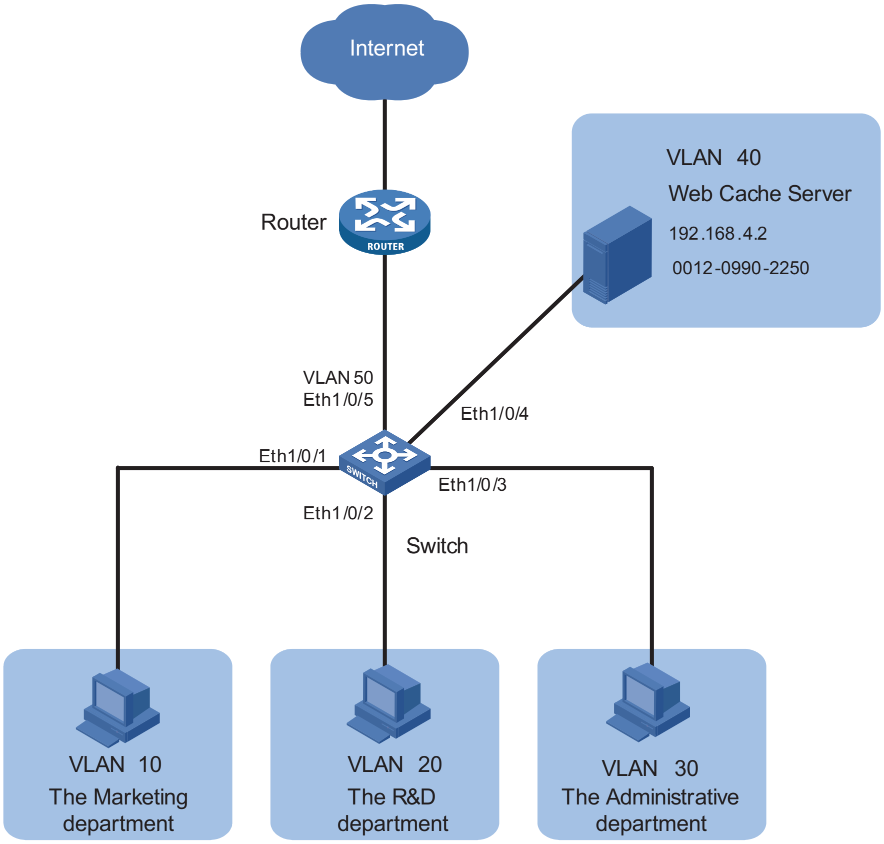
24 WEB CACHE REDIRECTION CONFIGURATION GUIDE

Configuring Web Cache Redirection

The Web cache redirection function redirects the packets accessing Web pages to a Web cache server, thus reducing the load on the links between a LAN and the Internet and improving the speed of obtaining information from the Internet.

Network Diagram

Figure 66 Network diagram for Web cache redirection configuration



Networking and Configuration Requirements

The network of a company is described as follows:

- The marketing department uses VLAN 10 and is connected to Ethernet 1/0/1 of the switch. The IP address of the VLAN interface for VLAN 10 is 192.168.1.1/24.
- The R&D department uses VLAN 20 and is connected to Ethernet 1/0/2 of the switch. The IP address of the VLAN interface for VLAN 20 is 192.168.2.1/24.
- The administration department uses VLAN 30 and is connected to Ethernet 1/0/3 of the switch. The IP address of the VLAN interface for VLAN 30 is 192.168.3.1/24.

- The Web cache server belongs to VLAN 40 and is connected to Ethernet 1/0/4 of the switch. The IP address of the VLAN interface for VLAN 40 is 192.168.4.1/24. The IP address and the MAC address of the Web cache server is 192.168.4.2 and 0012-0990-2250.
- The router is connected to Ethernet 1/0/5 of the switch. The switch accesses the Internet through a router. Ethernet 1/0/5 belongs to VLAN 50 whose VLAN interface is assigned IP address 192.168.5.1/24.

Enable Web cache redirection on the switch to redirect all the HTTP packets of the three departments to the Web cache server, thus reducing the load on the WAN link and improving the speed of obtaining information from the Internet.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions

Configuration Procedure

Create VLAN 10 for the marketing department and configure the IP address of VLAN-interface 10 as 192.168.1.1.

```
<3Com> system-view
[3Com] vlan 10
[3Com-vlan10] port Ethernet 1/0/1
[3Com-vlan10] quit
[3Com] interface Vlan-interface 10
[3Com-Vlan-interface10] ip address 192.168.1.1 24
[3Com-Vlan-interface10] quit
```

# Create VLAN 20 for the R&D department and configure the IP address of VLAN-interface 20 as 192.168.2.1.

```
[3Com] vlan 20
[3Com-vlan20] port Ethernet 1/0/2
[3Com-vlan20] quit
[3Com] interface Vlan-interface 20
[3Com-Vlan-interface20] ip address 192.168.2.1 24
[3Com-Vlan-interface20] quit
```

# Create VLAN 30 for the administration department and configure the IP address of VLAN-interface 30 as 192.168.3.1.

```
[3Com] vlan 30
[3Com-vlan30] port Ethernet 1/0/3
[3Com-vlan30] quit
[3Com] interface Vlan-interface 30
[3Com-Vlan-interface30] ip address 192.168.3.1 24
[3Com-Vlan-interface30] quit
```

# Create VLAN 40 for the Web cache server and configure the IP address of VLAN-interface 40 as 192.168.4.1.

```
[3Com] vlan 40
[3Com-vlan40] port Ethernet 1/0/4
[3Com-vlan40] quit
[3Com] interface Vlan-interface 40
```

```
[3Com-Vlan-interface40] ip address 192.168.4.1 24
[3Com-Vlan-interface40] quit
```

# Create VLAN 50 for the switch to connect to the router and configure the IP address of VLAN-interface 50 as 192.168.5.1.

```
[3Com] vlan 50
[3Com-vlan50] port Ethernet 1/0/5
[3Com-vlan50] quit
[3Com] interface Vlan-interface 50
[3Com-Vlan-interface50] ip address 192.168.5.1 24
[3Com-Vlan-interface50] quit
```

# Configure Ethernet 1/0/4, the port connected to the Web cache server, as a trunk port, and configure the port to permit the packets of VLAN 40 and VLAN 50 to pass through.

```
[3Com] interface Ethernet 1/0/4
[3Com-Ethernet1/0/4] port link-type trunk
[3Com-Ethernet1/0/4] port trunk permit vlan 40 50
[3Com-Ethernet1/0/4] quit
```

# Enable Web cache redirection to redirect all the HTTP packets received from VLAN 10, VLAN 20, and VLAN 30 to the Web cache server.

```
[3Com] webcache address 192.168.4.2 mac 0012-0990-2250 vlan 40 port
Ethernet 1/0/4
[3Com] webcache redirect-vlan 10
[3Com] webcache redirect-vlan 20
[3Com] webcache redirect-vlan 30
```

Complete Configuration

```
#
vlan 10
#
vlan 20
#
vlan 30
#
vlan 40
#
vlan 50
#
interface Vlan-interface10
 ip address 192.168.1.1 255.255.255.0
#
interface Vlan-interface20
 ip address 192.168.2.1 255.255.255.0
#
interface Vlan-interface30
 ip address 192.168.3.1 255.255.255.0
#
interface Vlan-interface40
 ip address 192.168.4.1 255.255.255.0
#
interface Vlan-interface50
 ip address 192.168.5.1 255.255.255.0
#
```

```
interface Ethernet1/0/1
 port access vlan 10
#
interface Ethernet1/0/2
 port access vlan 20
#
interface Ethernet1/0/3
 port access vlan 30
#
interface Ethernet1/0/4
 port link-type trunk
 port trunk permit vlan 1 40 50
 webcache address 192.168.4.2 mac 0012-0990-2250 vlan 40
#
 webcache redirect-vlan 10
 webcache redirect-vlan 20
 webcache redirect-vlan 30
#
```

Precautions

When configuring Web cache redirection, consider the following:

- To ensure the success of Web cache redirection, check that the VLAN-interfaces for all the involved VLANs (VLAN 40, VLAN 10, VLAN 20, and VLAN 30) are up.
- Do not redirect the HTTP packets destined for VLAN 40 to the Web cache server.
- Enabling STP can cause Web cache redirection failure. To avoid this, set the port connected to the Web cache server as a hybrid or trunk port and configure the port to permit the packets of the VLAN for the Internet access service (for example, VLAN 50 in Figure 66).

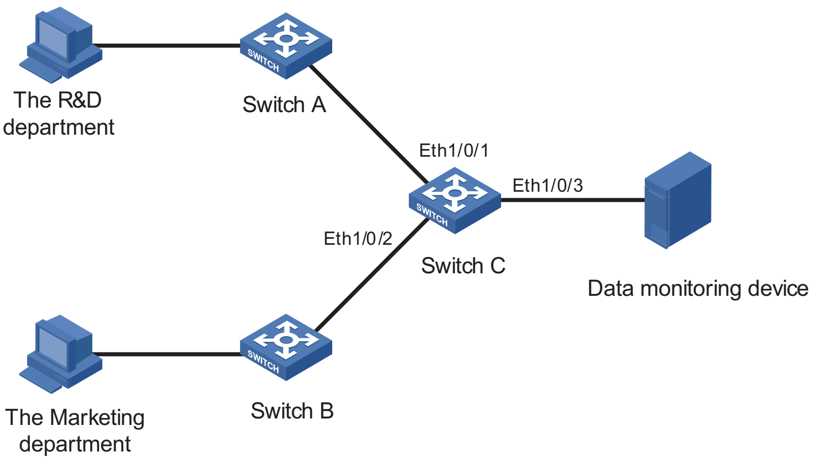
25 MIRRORING CONFIGURATION GUIDE

Local Port Mirroring Configuration

In local port mirroring, packets of one or more source ports of a device are copied to a destination port on the device for packet analysis and monitoring. In local port mirroring, the source ports and the destination port are on the same device.

Network Diagram

Figure 67 Network diagram for local port mirroring



Networking and Configuration Requirements

The departments of a company connect to each other through the Switch 5500:

- Research and Development (R&D) department is connected to Switch C through Ethernet 1/0/1.
- Marketing department is connected to Switch C through Ethernet 1/0/2.
- Data monitoring device is connected to Switch C through Ethernet 1/0/3.

The administrator wants to monitor the packets received and sent by the R&D department and the marketing department through the data monitoring device.

Use the local port mirroring function to meet the requirement. Perform the following configurations on Switch C.

- Configure Ethernet 1/0/1 and Ethernet 1/0/2 as mirroring source ports.
- Configure Ethernet 1/0/3 as the mirroring destination port.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions

Product series	Software version	Hardware version
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

Configure Switch C:

# Create a local mirroring group.

```
<3Com> system-view
[3Com] mirroring-group 1 local
```

# Configure the source ports and destination port for the local mirroring group.

```
[3Com] mirroring-group 1 mirroring-port Ethernet 1/0/1 Ethernet 1/0/2 both
[3Com] mirroring-group 1 monitor-port Ethernet 1/0/3
```

Complete Configuration

```
#
 mirroring-group 1 local
#
interface Ethernet1/0/1
 mirroring-group 1 mirroring-port both
#
interface Ethernet1/0/2
 mirroring-group 1 mirroring-port both
#
interface Ethernet1/0/3
 mirroring-group 1 monitor-port
#
```

Precautions

When configuring local port mirroring, note the following:

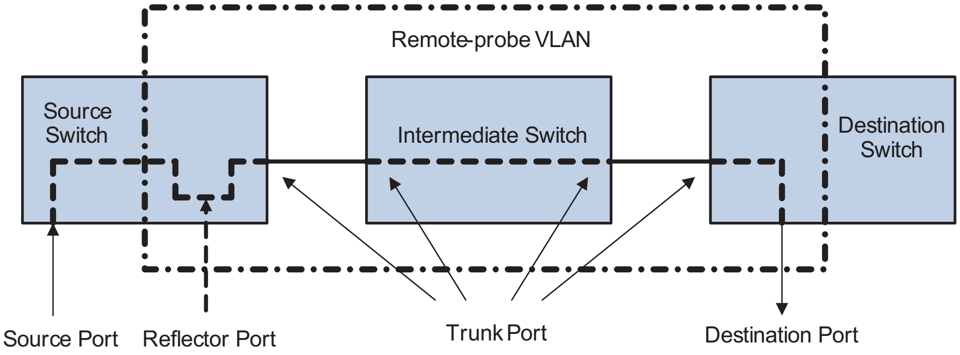
- Packets sent from the switch CPU cannot be mirrored.
- Packets received on the destination port are those processed and forwarded by the switch.
- The local mirroring group takes effect only after a source port and a destination port are added to it.
- The source port or destination port to be configured cannot be a fabric port (only the Switch 5500/5500G have this limitation), or a member port of an existing mirroring group; besides, a destination port cannot be a member port of an aggregation group, an LACP-enabled port, or an STP enabled port.
- When you configure a mirroring destination port on the Switch 5500, if mirroring group 1 does not exist on the switch, the switch will automatically create local mirroring group 1 and add the destination port to the group; if port mirroring group 1 already exists but is not a local mirroring group, your configuration of the destination port will fail.
- On a Switch 4500, if you execute the **monitor-port** command on different ports to configure the mirroring destination port for the switch, the last configuration takes effect.

Remote Port Mirroring Configuration

Remote port mirroring does not require the source and destination ports to be on the same device. The source and destination ports can be located on multiple devices across the network. Therefore, administrators can monitor the traffic on remote devices conveniently.

A special VLAN, called remote-probe VLAN, is needed to implement remote port mirroring. All mirrored packets are sent from the reflector port of the source switch to the monitor port (destination port) of the destination switch through the remote-probe VLAN, so that you can monitor packets received on and sent from the source switch on the destination switch. Figure 68 illustrates the implementation of remote port mirroring.

Figure 68 Remote port mirroring application

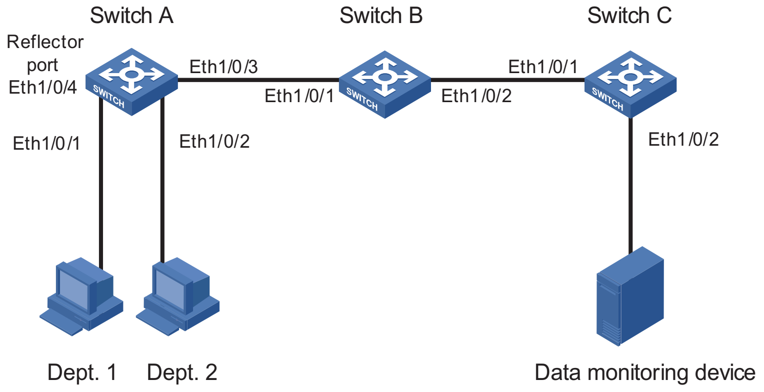


Switches involved in remote port mirroring play one of the following three roles:

- Source switch: The monitored port resident switch. It copies traffic to the reflector port, which then transmits the traffic to an intermediate switch or the destination switch through the remote-probe VLAN.
- Intermediate switch: Switches between the source switch and the destination switch on the network. An intermediate switch forwards mirrored traffic to the next intermediate switch or the destination switch through the remote-probe VLAN. No intermediate switch is present if the source switch and the destination switch are directly connected to each other.
- Destination switch: The remote mirroring destination port resident switch. It forwards mirrored traffic received from the remote-probe VLAN to the monitoring device through the destination port.

Network Diagram

Figure 69 Network diagram for remote port mirroring



Networking and Configuration Requirements

The departments of a company connect to each other through Switch 5500s:

- Switch A, Switch B, and Switch C are Switch 5500s.
- Department 1 is connected to Ethernet 1/0/1 of Switch A.
- Department 2 is connected to Ethernet 1/0/2 of Switch A.
- Ethernet 1/0/3 of Switch A connects to Ethernet 1/0/1 of Switch B.
- Ethernet 1/0/2 of Switch B connects to Ethernet 1/0/1 of Switch C.
- Data monitoring device is connected to Ethernet 1/0/2 of Switch C.

The administrator wants to monitor the packets sent from Department 1 and 2 through the data monitoring device.

Use the remote port mirroring function to meet the requirement. Perform the following configurations:

- Use Switch A as the source switch, Switch B as the intermediate switch, and Switch C as the destination switch.
- On Switch A, create a remote source mirroring group, configure VLAN 10 as the remote-probe VLAN, ports Ethernet 1/0/1 and Ethernet 1/0/2 as the source ports, and port Ethernet 1/0/4 as the reflector port.
- On Switch B, configure VLAN 10 as the remote-probe VLAN.
- Configure Ethernet 1/0/3 of Switch A, Ethernet 1/0/1 and Ethernet 1/0/2 of Switch B, and Ethernet 1/0/1 of Switch C as Trunk ports, allowing packets of VLAN 10 to pass.
- On Switch C, create a remote destination mirroring group, configure VLAN 10 as the remote-probe VLAN, and configure Ethernet 1/0/2 connected with the data monitoring device as the destination port.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4210		All versions

Configuration Procedure

1 Configure the source switch (Switch A)

# Create remote source mirroring group 1.

```
<3Com> system-view
[3Com] mirroring-group 1 remote-source
```

# Configure VLAN 10 as the remote-probe VLAN.

```
[3Com] vlan 10
[3Com-vlan10] remote-probe vlan enable
[3Com-vlan10] quit
```

# Configure the source ports, reflector port, and remote-probe VLAN for the remote source mirroring group.

```
[3Com] mirroring-group 1 mirroring-port Ethernet 1/0/1 Ethernet 1/0/2 inbound
[3Com] mirroring-group 1 reflector-port Ethernet 1/0/4
[3Com] mirroring-group 1 remote-probe vlan 10
```

# Configure Ethernet 1/0/3 as a Trunk port, allowing packets of VLAN 10 to pass.

```
[3Com] interface Ethernet 1/0/3
[3Com-Ethernet1/0/3] port link-type trunk
[3Com-Ethernet1/0/3] port trunk permit vlan 10
```

2 Configure the intermediate switch (Switch B)

# Configure VLAN 10 as the remote-probe VLAN.

```
<3Com> system-view
[3Com] vlan 10
[3Com-vlan10] remote-probe vlan enable
[3Com-vlan10] quit
```

# Configure Ethernet 1/0/1 as a Trunk port, allowing packets of VLAN 10 to pass.

```
[3Com] interface Ethernet 1/0/1
[3Com-Ethernet1/0/1] port link-type trunk
[3Com-Ethernet1/0/1] port trunk permit vlan 10
```

# Configure Ethernet 1/0/2 as a Trunk port, allowing packets of VLAN 10 to pass.

```
[3Com] interface Ethernet 1/0/2
[3Com-Ethernet1/0/2] port link-type trunk
[3Com-Ethernet1/0/2] port trunk permit vlan 10
```

3 Configure the destination switch (Switch C)

# Create remote destination mirroring group 1.

```
<3Com> system-view
[3Com] mirroring-group 1 remote-destination
```

# Configure VLAN 10 as the remote-probe VLAN.

```
[3Com] vlan 10
[3Com-vlan10] remote-probe vlan enable
[3Com-vlan10] quit
```

# Configure the destination port and remote-probe VLAN for the remote destination mirroring group.

```
[3Com] mirroring-group 1 monitor-port Ethernet 1/0/2
[3Com] mirroring-group 1 remote-probe vlan 10
```

# Configure Ethernet 1/0/1 as a Trunk port, allowing packets of VLAN 10 to pass.

```
[3Com] interface Ethernet 1/0/1
[3Com-Ethernet1/0/1] port link-type trunk
[3Com-Ethernet1/0/1] port trunk permit vlan 10
```

Complete Configuration

1 Configuration on the source switch (Switch A)

```
#
 mirroring-group 1 remote-source
#
vlan 10
 remote-probe vlan enable
#
interface Ethernet1/0/1
 mirroring-group 1 mirroring-port inbound
#
interface Ethernet1/0/2
 mirroring-group 1 mirroring-port inbound
#
interface Ethernet1/0/3
 port link-type trunk
 port trunk permit vlan 1 10
#
interface Ethernet1/0/4
 duplex full
 speed 100
 mirroring-group 1 reflector-port
#
 mirroring-group 1 remote-probe vlan 10
#
```

2 Configuration on the intermediate switch (Switch B)

```
#
vlan 10
 remote-probe vlan enable
#
interface Ethernet1/0/1
 port link-type trunk
 port trunk permit vlan 1 10
#
interface Ethernet1/0/2
 port link-type trunk
 port trunk permit vlan 1 10
#
```

3 Configuration on the destination switch (Switch C)

```
#
 mirroring-group 1 remote-destination
#
vlan 10
 remote-probe vlan enable
#
interface Ethernet1/0/1
 port link-type trunk
 port trunk permit vlan 1 10
#
interface Ethernet1/0/2
 port access vlan 10
 mirroring-group 1 monitor-port
#
```

Precautions

Note the following when configuring the source switch:

- All ports in a remote source mirroring group are on the same switch (the source switch). A remote source mirroring group can have only one reflector port.
- The reflector port of a mirroring group cannot be a member port of another existing mirroring group, a fabric port (only the Switch 5500/5500G have this limitation), a member port of an aggregation group, or a port enabled with LACP or STP. It must be an Access port and cannot be configured with functions like VLAN-VPN, port loopback detection, packet filtering, QoS, port security, and so on.
- You cannot modify the duplex mode, port rate, and MDI attribute of a reflector port.
- Only an existing static VLAN can be configured as the remote-probe VLAN. To remove a remote-probe VLAN, you need to restore it to a normal VLAN first. A remote port mirroring group becomes invalid if the corresponding remote-probe VLAN is removed.
- Do not configure the default VLAN, management VLAN or dynamic VLAN as the remote-probe VLAN.
- Configure all ports connecting the devices in the remote-probe VLAN as Trunk ports, and ensure the Layer 2 connectivity from the source switch to the destination switch over the remote-probe VLAN.
- Do not configure a Layer 3 interface for the remote-probe VLAN, run other protocol packets, or carry other service packets on the remote-prove VLAN and do not use the remote-prove VLAN as the voice VLAN and protocol-based VLAN; otherwise, remote port mirroring may be affected.
- Do not configure a port connecting the intermediate switch or destination switch as the mirroring source port. Otherwise, traffic disorder may occur in the network.
- If the intermediate or destination switch is a Switch 5500/5500G, the bidirectional mirroring (the **both** keyword) function is not available.
- The Switch 4210do not support the **both** keyword configuration.

Note the following when configuring the destination switch:

- Packets sent from the switch CPU cannot be mirrored.

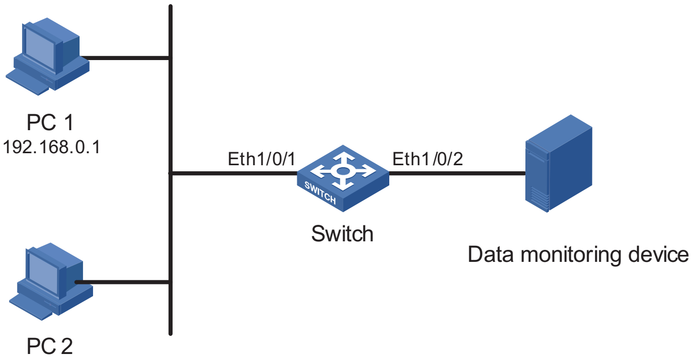
- Packets received on the destination port are those processed and forwarded by the switch.
- The destination port to be configured cannot be a member port of an existing mirroring group; a fabric port (only the Switch 5500/5500G have this limitation), a member port of an aggregation group, an LACP enabled port, or an STP enabled port.
- Only an existing static VLAN can be configured as the remote-probe VLAN. To remove a remote-probe VLAN, you need to restore it to a normal VLAN first. A remote port mirroring group becomes invalid if the corresponding remote-probe VLAN is removed.

Traffic Mirroring Configuration

In traffic mirroring, an ACL is applied to a port to identify traffics. Packets passing through the port and matching the ACL rules are mirrored to the destination port.

Network Diagram

Figure 70 Network diagram for traffic mirroring



Networking and Configuration Requirements

The departments of a company connect to each other through the Switch 5500:

- PC 1 and PC 2 are connected to Switch through Ethernet 1/0/1. The IP address of PC 1 is 192.168.0.1.
- Data monitoring device is connected to Ethernet 1/0/2 of Switch.

The administrator wants to monitor packets sent from PC 1 through the data monitoring device.

Use the traffic mirroring function to meet the requirement. Perform the following configurations on Switch:

- Configure traffic mirroring on Ethernet 1/0/1. Mirror packets matching source IP address 192.168.0.1 to the destination port.
- Configure Ethernet 1/0/2 as the destination port of traffic mirroring.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

Configure a basic ACL 2000, matching the packets whose source IP address is 192.168.0.1.

```
<3Com> system-view
[3Com] acl number 2000
[3Com-acl-basic-2000] rule permit source 192.168.0.1 0
[3Com-acl-basic-2000] quit
```

# Configure traffic mirroring on Ethernet 1/0/1. Mirror packets matching source IP address 192.168.0.1 to the destination port.

```
[3Com] interface Ethernet 1/0/1
[3Com-Ethernet1/0/1] mirrored-to inbound ip-group 2000 monitor-interface
[3Com-Ethernet1/0/1] quit
```

# Configure Ethernet 1/0/2 as the destination port of traffic mirroring.

```
[3Com] interface Ethernet 1/0/2
[3Com-Ethernet1/0/2] monitor-port
```

Complete Configuration

```
#
 mirroring-group 1 local
#
acl number 2000
 rule 0 permit source 192.168.0.1 0
#
interface Ethernet1/0/1
 mirrored-to inbound ip-group 2000 rule 0 monitor-interface
#
interface Ethernet1/0/2
 mirroring-group 1 monitor-port
#
```

Precautions

Note the following when configuring traffic mirroring:

- The destination port to be configured cannot be a member port of an existing mirroring group, a fabric port (only the Switch 5500/5500G have this limitation), a member port of an aggregation group, an LACP enabled port, or an STP enabled port.
- When you configure the destination port of traffic mirroring on a Switch 5500, if mirroring group 1 does not exist on the switch, the switch will automatically create local mirroring group 1 and add the destination port to the group; if mirroring group 1 already exists but is not a local mirroring group, your configuration of the destination port will fail.
- On a Switch 4500, if you execute the **monitor-port** command on different ports to configure the destination port for the switch, the last configuration takes effect.

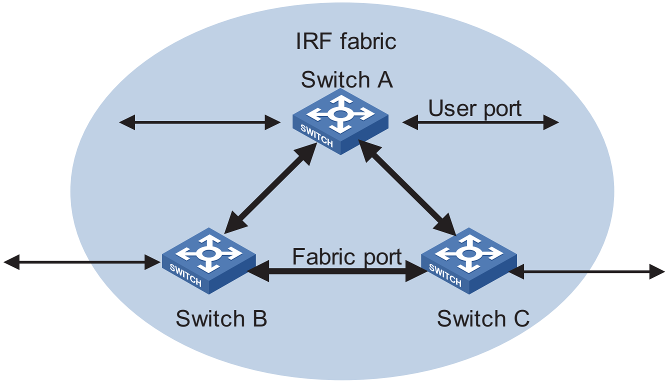
26 XRN Configuration Guide

XRN Fabric Configuration

Several Expandable Resilient Networking (XRN) supported switches can be interconnected to form a fabric, in which each switch is a unit, the ports connecting the units are called fabric ports, and the other ports that are used to connect the fabric to users are called user ports. In this way, you can increase ports of network devices and improve the reliability of user networks.

Network Diagram

Figure 71 Network diagram for XRN fabric configuration



Networking and Configuration Requirements

Configure unit ID, unit name, XRN fabric name, and fabric authentication mode for three switches to enable them to form an XRN fabric.

The configuration details are as follows:

- Unit IDs for Switch A, Switch B and Switch C are 1, 2 and 3 respectively;
- Unit names of the three switches are Unit1, Unit2 and Unit3 respectively. The fabric name is **hello**;
- Fabric authentication mode is simple and password is **welcome**.

The Switch 5500Gs do not support the fabric authentication function.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Fabric Cable Connection

You are recommended to connect the switches with cables after the configuration in "Configuration Procedure" on page 241 "Configuration Procedure" on page 241.

Fabric cable connection mode of Switch 5500s

When building an XRN fabric of Switch 5500s, note the fabric cable connection mode:

- Multiple Switch 5500s are interconnected through their fabric ports.
- A Switch 5500 has two fabric ports: left port and right port. Given a switch, its left port is connected to the right port of another switch, and its right port is connected to the left port of a third one.

On a Switch 5500, only four GigabitEthernet ports can be configured as fabric ports. The four ports fall into two groups according to their port numbers

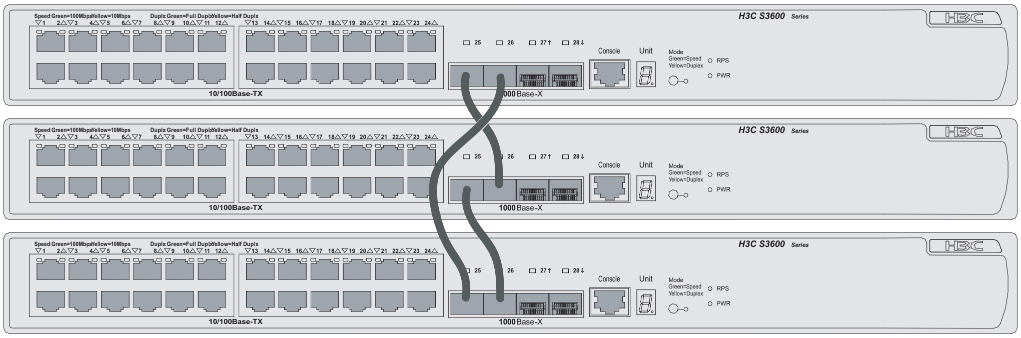
- *GigabitEthernet 1/1/1 and GigabitEthernet 1/1/2 form the first group.*
- *GigabitEthernet 1/1/3 and GigabitEthernet 1/1/4 form the second group.*

Only one group of ports can be configured as fabric ports at a time. GigabitEthernet 1/1/1 and GigabitEthernet 1/1/3 are the left fabric ports of the first and the second group respectively, and GigabitEthernet 1/1/2 and GigabitEthernet 1/1/4 are the right fabric ports or the first and the second group respectively.

An XRN fabric can be successfully built only when the fabric cables are connected in the above mode.

Based on the networking requirements in Figure 71, interconnect the three S3628P switches through their first group of fabric ports of as shown in the following figure:

Figure 72 Switch 5500 fabric port connection mode



Fabric cable connection mode of Switch 5500Gs switches

When building an XRN fabric of Switch 5500Gs, note the fabric cable connection mode:

- Multiple Switch 5500Gs are interconnected through their fabric ports on their rear panels.

- An Switch 5500Gs switch has two ports: up port and down port. Given a switch, its up port is connected to the down port of another switch, and its down port is connected to the up port of a third one.
- Plug the cable connectors completely into the fabric ports.

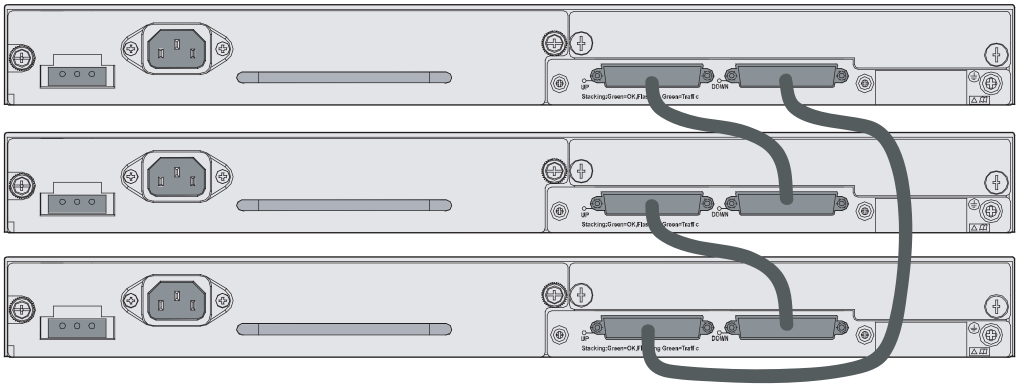
On a Switch 5500Gs Ethernet switch, only two special cascade ports can be configured as fabric ports. The two ports can only be used to form an XRN fabric, rather than function as normal ports. Their port numbers are

- *Up port: Cascade 1/2/1*
- *Down port: Cascade 1/2/2*

An XRN fabric can be successfully built only when the fabric cables are connected in the above mode.

Based on the networking requirements in Figure 71, interconnect the three Switch 5500Gs switches through their fabric ports as shown in the following figure:

Figure 73 Switch 5500Gs fabric port connection mode


UP
DOWN
Stacking:Green=OK,Flas Green=Traffic
UP
DOWN
Stacking:Green=OK,Fl Green=Traffic
UP
DOWN
Stacking:Green=OK,Fl Green=Traffic

Configuration Procedure

XRN fabric configuration on the Switch 5500

1 Configure Switch A.

# Bring up the fabric ports.

```
<3Com> system-view
[3Com] fabric-port GigabitEthernet 1/1/1 enable
[3Com] fabric-port GigabitEthernet 1/1/2 enable
```

# Configure the unit ID as 1.

```
[3Com] change self-unit to 1
```

When you modify the unit ID of a switch, the switch updates its configurations automatically. The update process takes some time, during which you cannot perform any configurations on the switch. If the system generates prompts after you enter a command, wait for the update to be finished.

# Configure the unit name as Unit1.

```
[3Com] set unit 1 name Unit1
```

# Configure the fabric name as **hello**.

```
[3Com] sysname hello
```

# Configure the authentication mode as **simple** and password as **welcome**.

```
[hello] XRN-fabric authentication-mode simple welcome
```

2 Configure Switch B.

# Bring up the fabric ports.

```
<3Com> system-view
[3Com] fabric-port GigabitEthernet 1/1/1 enable
[3Com] fabric-port GigabitEthernet 1/1/2 enable
```

# Configure the unit ID as 2.

```
[3Com] change self-unit to 2
```

# Configure the unit name as Unit2.

```
[3Com] set unit 2 name Unit2
```

# Configure the fabric name as **hello**.

```
[3Com] sysname hello
```

# Configure the authentication mode as **simple** and password as **welcome**.

```
[hello] XRN-fabric authentication-mode simple welcome
```

Perform the same configurations on Switch C.

3 After the above configuration, use the **display ftm information** command to view the running status of the XRN fabric.

```
[hello] display ftm information
FTM State        : HB STATE
Unit ID          : 1 (FTM-Master)

Fabric Type      : Ring
Fabric Auth      : Simple
Fabric Vlan ID   : 4093
Left Port        : Normal
Right Port       : Normal

Advertise        : Send = 5, Receive = 3
Advertise ACK    : Send = 0, Receive = 5
Heart Beat       : Send = 20, Receive = 0

Left Port        : Index = 255, IsEdge = 0
Right Port       : Index = 25, IsEdge = 0

Units Num Left   : 1
Units Num Right : 3

Units Num Backup: 2
```

By viewing the Left Port and Right Port fields in the output information, you can know the running status of the current fabric ports. The above prompt information indicates that the fabric ports are working normally (displayed as Normal).

You can also use the **display XRN** command to view the switches in the current XRN fabric.

```
[hello] display XRN-fabric
Fabric name is hello, system mode is L3.
Unit Name                                 Unit ID
unit1                                     1(*)
unit2                                     2
unit3                                     3
```

You can see from the above output information that the three switches have been successfully added to the XRN fabric, and your configurations have been finished.

XRN fabric configuration on Switch 5500Gs switches

1 Configure Switch A

# Bring up the fabric ports.

```
<3Com> system-view
[3Com] fabric-port Cascade 1/2/1 enable
[3Com] fabric-port Cascade 1/2/2 enable
```

# Configure the unit ID as 1.

```
[3Com] change self-unit to 1
```

# Configure the unit name as Unit1.

```
[3Com] set unit 1 name Unit1
```

# Configure the fabric name as **hello**.

```
[3Com] sysname hello
```

2 Configure Switch B.

# Bring up the fabric ports.

```
<3Com> system-view
[3Com] fabric-port Cascade 1/2/1 enable
[3Com] fabric-port Cascade 1/2/2 enable
```

# Configure the unit ID as 2.

```
[3Com] change self-unit to 2
```

# Configure the unit name as Unit2.

```
[3Com] set unit 2 name Unit2
```

# Configure the fabric name as **hello**.

```
[3Com] sysname hello
```

The configurations and verification on Switch C are the same as those on a Switch 5500. Therefore they are omitted here.

Complete Configuration

Complete configuration on the Switch 5500

To avoid repetition, only the complete configuration of Switch A is listed below.

- Configuration on Switch A.

```
#
system-view
fabric-port GigabitEthernet 1/1/1 enable
fabric-port GigabitEthernet 1/1/2 enable
#
change unit-id 1 to 1
#
set unit 1 name Unit1
#
sysname hello
#
XRN-fabric authentication-mode simple welcome
```

Complete configuration on Switch 5500Gs switches

To avoid repetition, only the complete configuration of Switch A is listed below.

- Configurations on Switch A.

```
#
system-view
fabric-port Cascade 1/2/1 enable
fabric-port Cascade 1/2/2 enable
#
change unit-id 1 to 1
#
set unit 1 name Unit1
#
sysname hello
#
```

*The **change unit-id** and **set unit name** commands will not be saved in the configuration file, that is, when you use the **display current-configuration** or **display saved-configuration** command to view the content of the configuration file, the two commands are not displayed.*

Precautions

- Before configuring an XRN fabric, make sure that the software versions of each switch are the same.
- Make sure that the switches in a fabric are correctly interconnected through the fabric ports.
- Establishing an XRN system requires a high consistency of the configuration of each device. Hence, before you enable the fabric port, do not perform any configuration for the port, and do not configure some functions that affect the XRN (such as HWTACACS and VLAN-VPN) for other ports or globally.

Otherwise, you cannot enable the fabric port. For detailed restrictions, refer to the error information output by devices.

- When configuring XRN, do not configure other functions, and before configuring other functions, make sure the fabric has been established and works normally.
- After a fabric is established, do not remove or plug in the cables used to form the fabric or shut down/bring up a fabric port, do not modify the unit ID of the device, and keep stability of the links between fabric ports to avoid fabric split.
- In an XRN fabric, it is required to keep the global configurations on all the fabric members consistent. If the global configurations on a switch are different from those on other switches, XRN will restart the switch forcibly and generate the same global configurations for the switch. Therefore, before building an XRN fabric, make sure the global configurations on all the switches are the same, and backup the existing configurations as needed to avoid configuration loss in case of switch restart.
- Do not modify the global configurations of any member switch when an XRN fabric is being built or the topology is unstable, so as to avoid switch restart due to global configuration inconsistency of member switches.
- If a Switch 5500G with half-slot module exists in a fabric, control the number of VLANs to raise the stability of the XRN fabric.

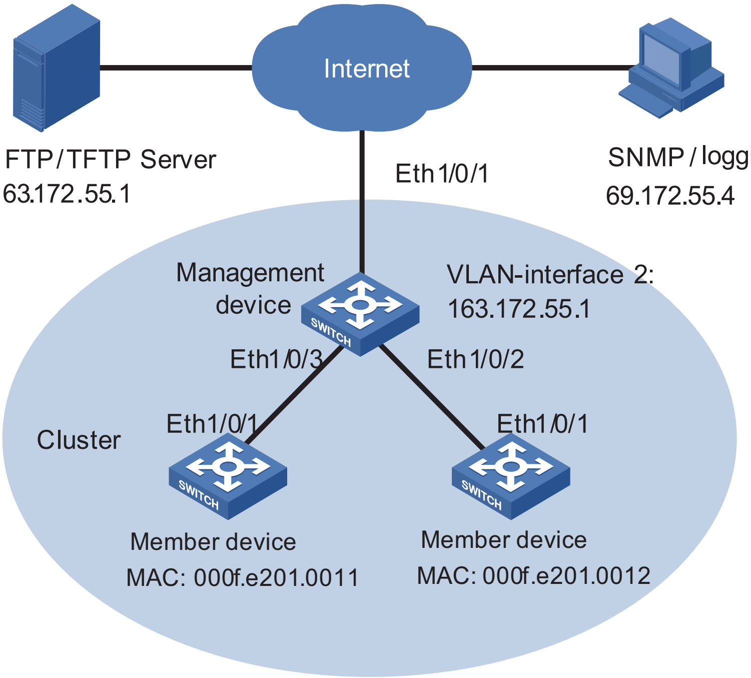
27 CLUSTER CONFIGURATION GUIDE

Cluster Configuration

The cluster function is implemented through 3Com Group Management Protocol version 2 (Switch Clusteringv2). Using Switch Clusteringv2, you can manage multiple switches through the public IP address of a master device. In a cluster, the master switch is called the management device, and the managed switches are called member devices. The member devices are not configured with public IP addresses. They are managed and maintained through the management device redirection.

Network Diagram

Figure 74 Network diagram for cluster



Networking and Configuration Requirements

Three switches form a cluster, where:

- A Switch 5500 serves as the management device.
- The other two switches are member devices.

Serving as the management device, the Switch 5500 manages the two member devices. The configurations for the cluster are as follows:

- The two member devices are connected to Ethernet 1/0/2 and Ethernet 1/0/3 of the management device.
- The management device connects to the Internet through Ethernet 1/0/1.

- Ethernet 1/0/1 belongs to VLAN 2, whose interface IP address is 163.172.55.1.
- All the devices in the cluster share the same FTP/TFTP server.
- The FTP/TFTP server uses IP address 63.172.55.1.
- The NMS/logging host uses IP address 69.172.55.4.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

The Switch 4210 cannot be used as a management switch.

Configuration Procedure

1 Configure the member devices (taking one member as an example)

# Enable NDP globally and on Ethernet 1/0/1.

```
<3Com> system-view
[3Com] ndp enable
[3Com] interface Ethernet 1/0/1
[3Com-Ethernet1/0/1] ndp enable
[3Com-Ethernet1/0/1] quit
```

# Enable NTDP globally and on Ethernet 1/0/1.

```
[3Com] ntdp enable
[3Com] interface Ethernet 1/0/1
[3Com-Ethernet1/0/1] ntdp enable
[3Com-Ethernet1/0/1] quit
```

# Enable the cluster function.

```
[3Com] cluster enable
```

2 Configure the management device

# Add port Ethernet 1/0/1 to VLAN 2.

```
<3Com> system-view
[3Com] vlan 2
[3Com-vlan2] port Ethernet 1/0/1
[3Com-vlan2] quit
```

# Configure the IP address for VLAN-interface 2 as 163.172.55.1.

```
[3Com] interface Vlan-interface 2
[3Com-Vlan-interface2] ip address 163.172.55.1 255.255.255.0
[3Com-Vlan-interface2] quit
```

# Disable NDP on Ethernet 1/0/1 of the management device.

```
[3Com] ndp enable
[3Com] undo ndp enable intferface Ethernet 1/0/1
[3Com] interface Ethernet 1/0/1
[3Com-Ethernet1/0/1] undo ntdp enable
[3Com-Ethernet1/0/1] quit
```

# Enable NDP on Ethernet 1/0/2 and Ethernet 1/0/3.

```
[3Com] interface Ethernet 1/0/2
[3Com-Ethernet1/0/2] ndp enable
[3Com-Ethernet1/0/2] quit
[3Com] interface Ethernet 1/0/3
[3Com-Ethernet1/0/3] ndp enable
[3Com-Ethernet1/0/3] quit
```

# Set the holdtime of NDP information to 200 seconds.

```
[3Com] ndp timer aging 200
```

# Set the interval between sending NDP packets to 70 seconds.

```
[3Com] ndp timer hello 70
```

# Enable NTDP globally and on Ethernet 1/0/2 and Ethernet 1/0/3.

```
[3Com] ntdp enable
[3Com] interface Ethernet 1/0/2
[3Com-Ethernet1/0/2] ntdp enable
[3Com-Ethernet1/0/2] quit
[3Com] interface Ethernet 1/0/3
[3Com-Ethernet1/0/3] ntdp enable
[3Com-Ethernet1/0/3] quit
```

# Set the topology collection range to two hops.

```
[3Com] ntdp hop 2
```

# Set the delay for a member device to forward topology collection request to 150 ms.

```
[3Com] ntdp timer hop-delay 150
```

# Set the delay for a port of a member device to forward topology collection request to 15 ms.

```
[3Com] ntdp timer port-delay 15
```

# Set the topology collection interval to three minutes.

```
[3Com] ntdp timer 3
```

# Enable the cluster function.

```
[3Com] cluster enable
```

# Enter cluster view.

```
[3Com] cluster
[3Com-cluster]
```

# Configure a private IP address pool for a cluster. The IP address pool contains six IP addresses, starting from 172.16.0.1.

```
[3Com-cluster] ip-pool 172.16.0.1 255.255.255.248
```

# Name and build a cluster.

```
[3Com-cluster] build aaa
[aaa_0.3Com-cluster]
```

# Add the two switches attached to the management device to the cluster.

```
[aaa_0.3Com-cluster] add-member 1 mac-address 00e0-fc01-0011
[aaa_0.3Com-cluster] add-member 17 mac-address 00e0-fc01-0012
```

# Set the holdtime of member device information to 100 seconds.

```
[aaa_0.3Com-cluster] holdtime 100
```

# Set the interval between sending handshake packets to 10 seconds.

```
[aaa_0.3Com-cluster] timer 10
```

# Configure VLAN-interface 2 as the network management interface.

```
[aaa_0.3Com-cluster] nm-interface Vlan-interface 2
```

# Configure the shared FTP server, TFTP server, logging host and SNMP host for the cluster.

```
[aaa_0.3Com-cluster] ftp-server 63.172.55.1
[aaa_0.3Com-cluster] tftp-server 63.172.55.1
[aaa_0.3Com-cluster] logging-host 69.172.55.4
[aaa_0.3Com-cluster] snmp-host 69.172.55.4
```

3 Perform the following operations on the member devices (taking one member as an example)

After the devices attached to the management device are added to the cluster, perform the following operations on the member devices.

# Connect the member device to the remote FTP server shared by the cluster.

```
<aaa_1.3Com> ftp cluster
```

# Download file **aaa.txt** from the shared TFTP server to the member device.

```
<aaa_1.3Com> tftp cluster get aaa.txt
```

# Upload file **bbb.txt** from the member device to the shared TFTP server.

```
<aaa_1.3Com> tftp cluster put bbb.txt
```

Complete Configuration

1 Configurations on the management device

```
#
interface Vlan-interface2
 ip address 163.172.55.1 255.255.255.0
#
 ntdp hop 2
 ntdp timer port-delay 15
 ntdp timer hop-delay 150
 ntdp timer 3
#
 ndp timer hello 70
 ndp timer aging 200
#
cluster
 ip-pool 172.16.0.1 255.255.255.248
 build aaa
 holdtime 100
 nm-interface Vlan-interface2
 ftp-server 63.172.55.1
 tftp-server 63.172.55.1
 logging-host 69.172.55.4
 snmp-host 69.172.55.4
#
```

Precautions

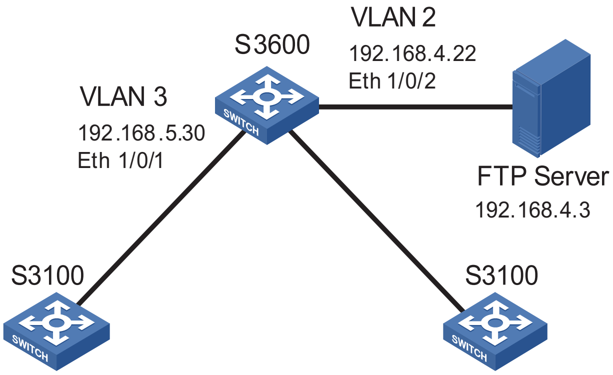
- After the above configuration, you can execute the **cluster switch-to** { *member-number* | **mac-address** *H-H-H* } command on the management device to switch to the view of a member device to maintain and manage the member device, and then use the **cluster switch-to administrator** command to return to the view of the management device.
- On the management device, you can use the **reboot member** { *member-number* | **mac**-**address** *H-H-H* } [**eraseflash**] command to reboot a member device. For detailed information about these operations, refer to "Complete Configuration" on page 251.
- After the above configuration, you can receive logs and SNMP trap messages of all the cluster members on the NMS.
- The switches cannot be used as TFTP servers.
- It is recommended not to transmit data packets in the management VLAN.

Network Management Interface Configuration

The Switch 5500 supports the network management interface configuration for a cluster. Through the network management interface of a cluster, you can manage the member devices of the cluster from outside of the cluster.

Network Diagram

Figure 75 Network diagram for network management interface configuration



Networking and Configuration Requirements

- Configure VLAN-interface 2 as the network management interface.
- Configure VLAN 3 as the management VLAN.
- The IP address of the FTP server is 192.168.4.3.
- The Switch 5500 is the management switch.
- The Switch 4210s are the member switches.

Table 4 Connection information of the management switch

VLAN	IP address	Connection port
VLAN 3 (connect Switch 4210s)	192.168.5.30/24	Ethernet 1/0/1
VLAN 2 (connect FTP Sever)	192.168.4.22/24	Ethernet 1/0/2

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

The Switch 4210 cannot be used as a management switch.

Configuration Procedure

Enter system view, and configure VLAN 3 as the management VLAN.

```
<3Com> system-view
[3Com] management-vlan 3
```

# Add Ethernet 1/0/1 to VLAN 3.

```
[3Com] vlan 3
[3Com-vlan3] port Ethernet 1/0/1
[3Com-vlan3] quit
```

# Configure the IP address of VLAN-interface 3 as 192.168.5.30.

```
[3Com] interface Vlan-interface 3
[3Com-Vlan-interface3] ip address 192.168.5.30 255.255.255.0
[3Com-Vlan-interface3] quit
```

# Add Ethernet 1/0/2 to VLAN 2.

```
[3Com] vlan 2
[3Com-vlan2] port Ethernet 1/0/2
[3Com-vlan2] quit
```

# Configure the IP address of VLAN-interface 2 as 192.168.4.22.

```
[3Com] interface Vlan-interface 2
[3Com-Vlan-interface2] ip address 192.168.4.22 255.255.255.0
[3Com-Vlan-interface2] quit
```

# Enable the cluster function.

```
[3Com] cluster enable
```

# Enter cluster view.

```
[3Com] cluster
[3Com-cluster]
```

# Configure a private IP address pool for a cluster. The IP address pool contains 30 IP addresses, starting from 192.168.5.1.

```
[3Com-cluster] ip-pool 192.168.5.1 255.255.255.224
```

# Name and build a cluster.

```
[3Com-cluster] build aaa
[aaa_0.3Com-cluster]
```

# Configure VLAN-interface 2 as the network management interface.

```
[aaa_0.3Com] cluster
[aaa_0.3Com-cluster] nm-interface Vlan-interface 2
```

Complete Configuration

```
#
interface Vlan-interface3
 ip address 192.168.5.30 255.255.255.0
#
interface Vlan-interface2
 ip address 192.168.4.22 255.255.255.0
#
 management-vlan 3
#
cluster
 ip-pool 192.168.5.1 255.255.255.224
 build aaa
 nm-interface Vlan-interface2
#
```

Precautions

- The default network management interface is the management VLAN interface.
- There can be only one network management interface. A new configuration will overwrite the previous one.

- The network management interface can be configured on the management switch only.

The network management interface cannot be configured on the Switch 4210.

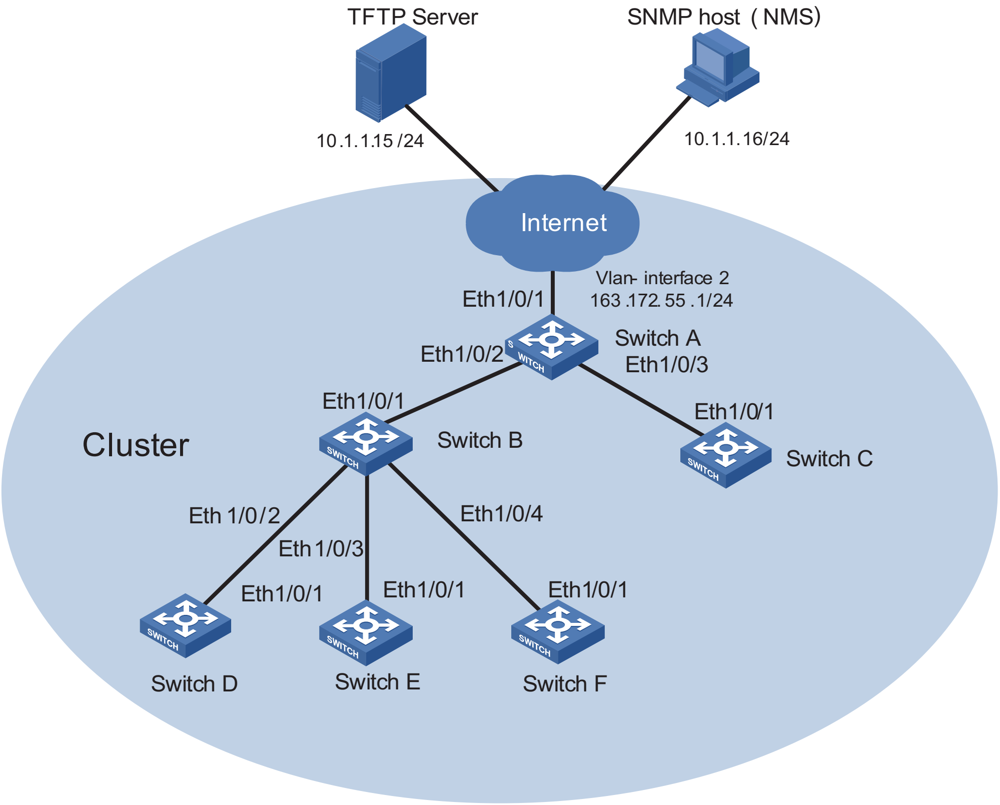
Cluster Configuration in Real Networking

In a complicated network, you can manage switches remotely in a bulk through Switch Clustering, reducing the workload of the network configuration.

After you build a cluster and enable Switch Clustering on the management switch, and enable NDP and Switch Clustering for the member devices, you can manage the member switches on the management switch.

Network Diagram

Figure 76 Network diagram for Switch Clustering cluster



Networking and Configuration Requirements

- The IP address of the management switch (Switch A) is 10.1.1.17.
- Configure the IP address of the TFTP server as 10.1.1.15.
- Configure the IP address of the SNMP NMS as 10.1.1.16.
- The whole cluster shares the same TFTP server and SNMP NMS.

Management switch Switch A:

- Ethernet 1/0/1 belongs to VLAN 2, whose interface IP address is 163.172.55.1.
- Two member switches are connected to Ethernet 1/0/1 and Ethernet 1/0/2 of the management switch.

The member switches:

- Member switch Switch B is connected to Switch D through Ethernet 1/0/2.
- Switch B is connected to Switch E through Ethernet 1/0/3.
- Switch B is connected to Switch F through Ethernet 1/0/4.

- *Switch A, Switch B and Switch C are usually the Switch 5500 and Switch 5500G.*
- *Switch D, Switch E and Switch F can be Switch 5500, Switch 5500Gs, and Switch 4210.*

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

1 Configure the member devices (taking Switch B as an example)

# Enable NDP globally.

```
<3Com> system-view
[3Com] ndp enable
```

# Enable NDP on Ethernet 1/0/1, Ethernet 1/0/2, Ethernet1/0/3, and Ethernet1/0/4.

```
[3Com] interface Ethernet 1/0/1
[3Com-Ethernet1/0/1] ndp enable
[3Com-Ethernet1/0/1] quit
[3Com] interface Ethernet 1/0/2
[3Com-Ethernet1/0/2] ndp enable
[3Com-Ethernet1/0/2] quit
[3Com] interface Ethernet 1/0/3
[3Com-Ethernet1/0/3] ndp enable
[3Com-Ethernet1/0/3] quit
[3Com] interface Ethernet 1/0/4
[3Com-Ethernet1/0/4] ndp enable
[3Com-Ethernet1/0/4] quit
```

# Enable NTDP globally.

```
[3Com] ntdp enable
```

# Enable NTDP on Ethernet 1/0/1, Ethernet 1/0/2, Ethernet1/0/3, and Ethernet1/0/4.

```
[3Com] interface Ethernet 1/0/1
[3Com-Ethernet1/0/1] ntdp enable
[3Com-Ethernet1/0/1] quit
```

```
[3Com] interface Ethernet 1/0/2
[3Com-Ethernet1/0/2] ntdp enable
[3Com-Ethernet1/0/2] quit
[3Com] interface Ethernet 1/0/3
[3Com-Ethernet1/0/3] ntdp enable
[3Com-Ethernet1/0/3] quit
[3Com] interface Ethernet 1/0/4
[3Com-Ethernet1/0/4] ntdp enable
[3Com-Ethernet1/0/4] quit
```

# Enable the cluster function.

```
[3Com] cluster enable
```

On the member switches, ports that connect to other switches all need to be enabled with NDP and NTDP.

2 Configure the management device (Switch A)

# Disable NDP on Ethernet 1/0/1 of the management device.

```
<3Com> system-view
[3Com] ndp enable
[3Com] undo ndp enable intferface Ethernet 1/0/1
```

# Enable NDP on Ethernet 1/0/2 and Ethernet 1/0/3.

```
[3Com] interface Ethernet 1/0/2
[3Com-Ethernet1/0/2] ndp enable
[3Com-Ethernet1/0/2] quit
[3Com] interface Ethernet 1/0/3
[3Com-Ethernet1/0/3] ndp enable
[3Com-Ethernet1/0/3] quit
```

# Set the holdtime of NDP information to 300 seconds.

```
[3Com] ndp timer aging 300
```

# Set the interval between sending NDP packets to 100 seconds.

```
[3Com] ndp timer hello 100
```

# Enable NTDP globally and on Ethernet 1/0/2 and Ethernet 1/0/3.

```
[3Com] ntdp enable
[3Com] interface Ethernet 1/0/2
[3Com-Ethernet1/0/2] ntdp enable
[3Com-Ethernet1/0/2] quit
[3Com] interface Ethernet 1/0/3
[3Com-Ethernet1/0/3] ntdp enable
[3Com-Ethernet1/0/3] quit
```

# Set the topology collection range to two hops.

```
[3Com] ntdp hop 2
```

# Set the delay for a member device to forward topology collection request to 180 ms.

```
[3Com] ntdp timer hop-delay 180
```

# Set the delay for a port of a member device to forward topology collection request to 20 ms.

```
[3Com] ntdp timer port-delay 20
```

# Set the topology collection interval to three minutes.

```
[3Com] ntdp timer 3
```

# Enable the cluster function.

```
[3Com] cluster enable
```

# Enter cluster view.

```
[3Com] cluster
[3Com-cluster]
```

# Configure a private IP address pool for a cluster. The IP address pool contains six IP addresses, starting from 172.16.0.1.

```
[3Com-cluster] ip-pool 172.16.0.1 255.255.255.248
```

# Name and build a cluster.

```
[3Com-cluster] build aaa
[aaa_0.3Com-cluster]
```

# Set the holdtime of member device information to 100 seconds.

```
[aaa_0.3Com-cluster] holdtime 100
```

# Set the interval between sending handshake packets to 10 seconds.

```
[aaa_0.3Com-cluster] timer 10
```

# Configure the TFTP server and SNMP NMS shared by the cluster.

```
[aaa_0.3Com-cluster] tftp-server 10.1.1.15
[aaa_0.3Com-cluster] snmp-host 10.1.1.16
```

3 Perform the following operations on the member devices (taking one member as an example):

After the devices attached to the management device are added to the cluster, perform the following operations on the member devices.

# Download file **aaa.txt** from the shared TFTP server to the member device.

```
<aaa_1.3Com> tftp cluster get aaa.txt
```

# Upload file **bbb.txt** from the member device to the shared TFTP server.

```
<aaa_1.3Com> tftp cluster put bbb.txt
```

Complete Configuration

1 Configuration on Switch A

```
#
 ntdp hop 2
 ntdp timer port-delay 20
 ntdp timer hop-delay 180
 ntdp timer 3
#
 ndp timer hello 100
 ndp timer aging 300
#
cluster
 ip-pool 172.16.0.1 255.255.255.248
 build aaa
 holdtime 100
 tftp-server 10.1.1.15
 snmp-host 10.1.1.16
#
```

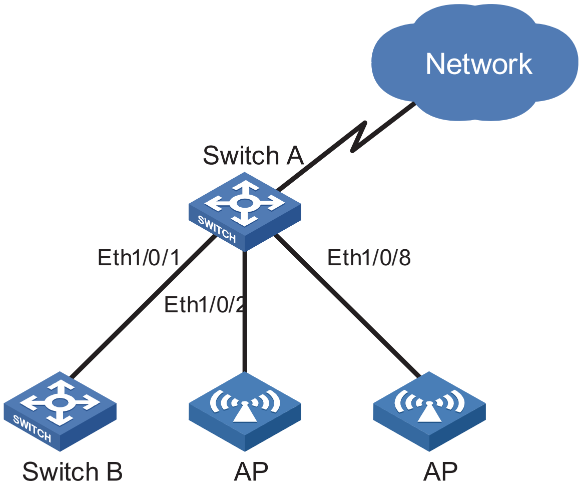
28 POE/POE PROFILE CONFIGURATION GUIDE

PoE Configuration

Power over Ethernet (PoE)-enabled devices use 10BASE-T, 100BASE-TX and 1000BASE-T twisted pair cables to supply power to powered devices (PD) and implement power supply and data transmission simultaneously.

Network Diagram

Figure 77 Network diagram for PoE configuration



Networking and Configuration Requirements

- Switch A is a Switch 5500 supporting PoE and Switch B can be PoE powered.
- The Ethernet 1/0/1 and Ethernet 1/0/2 ports of Switch A are connected to Switch B and an Access Point (AP) respectively; the Ethernet 1/0/8 port is intended to be connected with an important AP.
- The PSE processing software of Switch A is first upgraded online. The remotely accessed PDs are powered by Switch A.
- The power consumption of the accessed AP is 2,500 milliwatts, and the maximum power consumption of Switch B is 12,000 milliwatts.
- It is required to guarantee the power supply to the AP connected to the Ethernet 1/0/8 even when Switch A is under full load.
-

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	Switch 5500 PoE switches
Switch 5500G	Release V03.02.04	Switch 5500 PoE switches
Switch 4500	Release V03.03.00	Switch 5500 PoE switches

Configuration Procedure

Upgrade the power processing software.

```
<SwitchA> system-view
[SwitchA] poe update refresh 0290_021.s19
Update PoE  board successfully
```

# Enable the PoE feature on ports Ethernet 1/0/1, Ethernet 1/0/2 and Ethernet 1/0/8.

```
[SwitchA] interface Ethernet 1/0/1
[SwitchA-Ethernet1/0/1] poe enable
[SwitchA-Ethernet1/0/1] quit
[SwitchA]interface Ethernet 1/0/2
[SwitchA-Ethernet1/0/2] poe enable
[SwitchA-Ethernet1/0/2] quit
[SwitchA] interface Ethernet 1/0/8
[SwitchA-Ethernet1/0/8] poe enable
[SwitchA-Ethernet1/0/8] quit
```

# Set the maximum power that Ethernet 1/0/1 and Ethernet 1/0/2 can provide for all PDs to 12000 and 2500 milliwatts respectively.

```
[SwitchA] interface Ethernet 1/0/1
[SwitchA-Ethernet1/0/1] poe max-power 12000
[SwitchA-Ethernet1/0/1] quit
[SwitchA] interface Ethernet 1/0/2
[SwitchA-Ethernet1/0/2] poe max-power 2500
[SwitchA-Ethernet1/0/2] quit
```

# Set the PoE priority of Ethernet 1/0/8 to **critical** to guarantee power supply to the device connected to Ethernet 1/0/8.

```
[SwitchA] interface Ethernet 1/0/8
[SwitchA-Ethernet1/0/8] poe priority critical
[SwitchA-Ethernet1/0/8] quit
```

# Set the power supply management mode of the switch to **auto** (The default power supply management mode is **auto**, and this step can be omitted.).

```
[SwitchA] poe power-management auto
```

# Enable the PD compatibility detection function to allow the switch to supply power to the PDs not compliant with the 802.3af standard.

```
[SwitchA] poe legacy enable
```

# View the power supply status of all the ports on the switch after the configuration.

```
[SwitchA] display poe interface
       PORT INDEX      POWER ENABLE   MODE  PRIORITY       STATUS
 Ethernet1/0/1          on   enable  signal  low      Standard PD was detected
 Ethernet1/0/2          on   enable  signal  low      Standard PD was detected
 Ethernet1/0/3          off  enable  signal  low      detection is in process
 Ethernet1/0/4          off  enable  signal  low      detection is in process
 Ethernet1/0/5          off  enable  signal  low      detection is in process
 Ethernet1/0/6          off  enable  signal  low      detection is in process
 Ethernet1/0/7          off  enable  signal  low      detection is in process
 Ethernet1/0/8          on   enable  signal  critical Standard PD was detected
......
```

# View the PoE power information of all the ports on the switch.

```
<SwitchA> display poe interface power
       PORT INDEX       POWER (mW)              PORT INDEX      POWER (mW)
 Ethernet1/0/1           11500           Ethernet1/0/2          2300
 Ethernet1/0/3           0                Ethernet1/0/4          0
 Ethernet1/0/5           0                Ethernet1/0/6          0
 Ethernet1/0/7           0                Ethernet1/0/8          2400
......
```

Complete Configuration

```
#
 poe legacy enable
#
interface Ethernet1/0/1
 poe enable
 poe max-power 12000
#
interface Ethernet1/0/2
 poe enable
 poe max-power 2500
#
interface Ethernet1/0/8
 poe enable
 poe priority critical
```

Precautions

None

PoE Profile Configuration

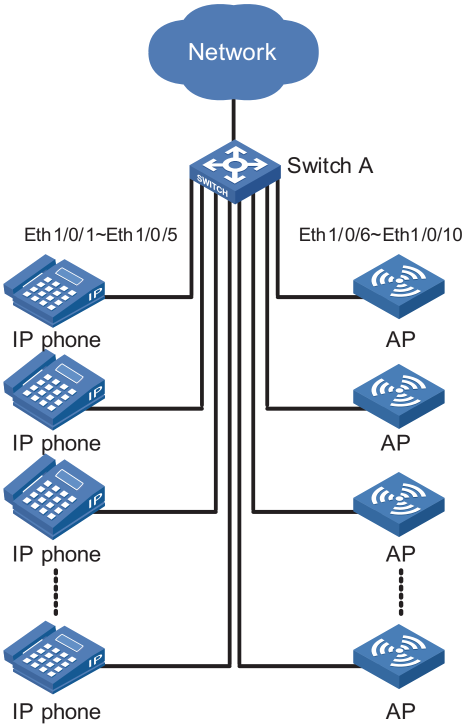
A PoE profile is a set of PoE configurations, including multiple PoE features.

Features of PoE profile:

- Various PoE profiles can be created. PoE policy configurations applicable to different user groups are saved in the corresponding PoE profiles. These PoE profiles can be applied to the ports used by the corresponding user groups.
- When users connect a PD to a PoE-profile-enabled port, the PoE configurations in the PoE profile will be enabled on the port.

Network Diagram

Figure 78 Network diagram for PoE profile configuration



Networking and Configuration Requirements

Switch A is a Switch 5500 supporting PoE. Ethernet 1/0/1 through Ethernet 1/0/10 of Switch A are used by users of group A, whom have the following requirements:

- The PoE function can be enabled on all ports in use.
- Signal mode is used to supply power.
- The PoE priority for Ethernet 1/0/1 through Ethernet 1/0/5 is **critical**, whereas the PoE priority for Ethernet 1/0/6 through Ethernet 1/0/10 is **high**.
- The maximum power for Ethernet 1/0/1 through Ethernet 1/0/5 is 3000 milliwatts, whereas the maximum power for Ethernet 1/0/6 through Ethernet 1/0/10 is 15400 milliwatts.

Based on the above requirements, two PoE profiles are made for users of group A.

- Apply PoE profile 1 for Ethernet 1/0/1 through Ethernet 1/0/5;
- Apply PoE profile 2 for Ethernet 1/0/6 through Ethernet 1/0/10.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	Switch 5500 PoE switches
Switch 5500G	Release V03.02.04	Switch 5500 PoE switches
Switch 4500	Release V03.03.00	Switch 5500 PoE switches

Configuration Procedure

Create Profile1 and enter PoE profile view.

```
<SwitchA> system-view
[SwitchA] poe-profile Profile1
```

# In Profile1, add the PoE policy configuration applicable to Ethernet 1/0/1 through Ethernet 1/0/5 for users of group A.

```
[SwitchA-poe-profile-Profile1] poe enable
[SwitchA-poe-profile-Profile1] poe mode signal
[SwitchA-poe-profile-Profile1] poe priority critical
[SwitchA-poe-profile-Profile1] poe max-power 3000
[SwitchA-poe-profile-Profile1] quit
```

# Create Profile2 and enter PoE profile view.

```
[SwitchA] poe-profile Profile2
```

# In Profile2, add the PoE policy configuration applicable to Ethernet 1/0/6 through Ethernet 1/0/10 for users of group A.

```
[SwitchA-poe-profile-Profile2] poe enable
[SwitchA-poe-profile-Profile2] poe mode signal
[SwitchA-poe-profile-Profile2] poe priority high
[SwitchA-poe-profile-Profile2] poe max-power 15400
[SwitchA-poe-profile-Profile2] quit
```

# Apply the configured Profile1 to Ethernet 1/0/1 through Ethernet 1/0/5.

```
[SwitchA] apply poe-profile Profile1 interface Ethernet1/0/1 to Ethernet1/0/5
```

# Apply the configured Profile2 to Ethernet 1/0/6 through Ethernet 1/0/10.

```
[SwitchA] apply poe-profile Profile2 interface Ethernet1/0/6 to Ethe
rnet1/0/10
```

Complete Configuration

```
#
poe-profile Profile1
 poe enable
 poe max-power 3000
 poe priority critical
poe-profile Profile2
 poe enable
 poe priority high
#
interface Ethernet1/0/1
apply poe-profile Profile1
#
interface Ethernet1/0/2
apply poe-profile Profile1
#
interface Ethernet1/0/3
apply poe-profile Profile1
#
interface Ethernet1/0/4
 apply poe-profile Profile1
#
interface Ethernet1/0/5
 apply poe-profile Profile1
#
interface Ethernet1/0/6
 apply poe-profile Profile2
```

```
#
interface Ethernet1/0/7
 apply poe-profile Profile2
#
interface Ethernet1/0/8
 apply poe-profile Profile2
#
interface Ethernet1/0/9
 apply poe-profile Profile2
#
interface Ethernet1/0/10
 apply poe-profile Profile2
```

Precautions

1 When the **apply poe-profile** command is used to apply a PoE profile to a port, some PoE features can be applied successfully while some cannot. PoE profiles are applied to Switch 5500/5500G according to the following rules:

- When the apply poe-profile command is used to apply a PoE profile to a port, the PoE profile is applied successfully as long as one PoE feature in the PoE profile is applied properly. When the display current-configuration command is used for query, it is displayed that the PoE profile is applied properly to the port.
- If one or more features in the PoE profile are not applied properly on a port, the switch will prompt explicitly which PoE features in the PoE profile are not applied properly on which ports.
- The display current-configuration command can be used to query which PoE profile is applied to a port. However, the command cannot be used to query which PoE features in a PoE profile are applied successfully.

2 If you cannot apply a PoE profile to a PoE port, it may be due to the following reasons:

- Some of the PoE features in the PoE profile have been configured through other modes;
- Some of the PoE features in the PoE profile are not compliant with the configuration requirements for PoE ports;
- Another PoE profile has been applied to this PoE port.

You can solve the problem in the following ways:

- In the first case, you can solve the problem by removing the original configurations.
- In the second case, you need to modify some configurations in the PoE profile.

In the third case, you need to remove the application of the undesired PoE profile from the PoE port.

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UDP Helper Configuration Guide

UDP Helper Configuration Guide

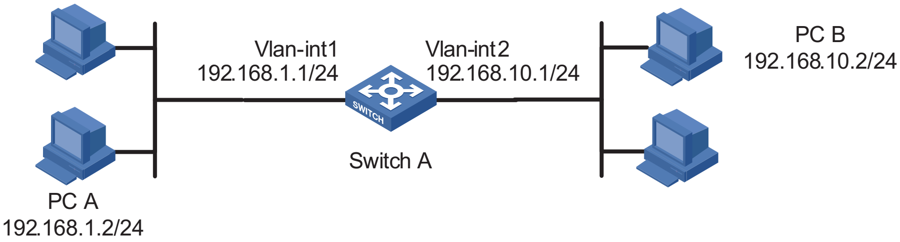
The Switch 5500 provides the UDP Helper function to relay specified UDP packets. In other words, UDP Helper functions as a relay agent that converts UDP broadcast packets into unicast packets and forwards them to a specified destination server.

With UDP Helper enabled, the device decides whether to forward a received UDP broadcast packet according to the UDP destination port number of the packet.

- If the destination port number of the packet matches a pre-configured port number on the device, the device modifies the destination IP address in the IP header and then sends the packet to the specified destination server.
- Otherwise, the device sends the packet to the upper layer protocol for processing.

Network Diagram

Figure 79 Network diagram for UDP Helper



Networking and Configuration Requirements

PC A resides on network segment 192.168.1.0/24 and PC B on 192.168.10.0/24; they are connected through Switch A and are reachable to each other.

It is required to configure UDP Helper on the switch, so that PC A can find PC B through computer search (Computer search uses broadcasts with the destination UDP port 137).

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

Enable Switch A to receive directed broadcasts to a directly connected network.

```
[SwitchA] ip forward-broadcast
```

# Enable UDP Helper on Switch A.

```
[SwitchA] udp-helper enable
```

# Configure the switch to forward broadcasts containing the destination UDP port number 137. (By default, the device, after enabled with UDP Helper, forwards the broadcasts containing the destination UDP port number 137.)

```
[SwitchA] udp-helper port 137
```

# Specify the destination server on VLAN-interface 1.

```
[SwitchA] interface Vlan-interface 1
[SwitchA-Vlan-interface1] udp-helper server 192.168.10.2
```

Complete Configuration

```
#
 ip forward-broadcast
#
 udp-helper enable
#
interface Vlan-interface
 udp-helper server 192.168.10.2
#
```

Precautions

- On a Switch 5500, the reception of directed broadcast packets to a directly connected network is disabled by default, but this feature must be enabled with the ip forward-broadcast command in system view before you can enable UDP Helper. For details about the ip forward-broadcast command, refer to “IP Addressing Configuration” and “IP Performance Configuration” in the *Configuration Guide* for your product.
- You need to enable UDP Helper before specifying any UDP port to match UDP broadcasts; otherwise, error information is displayed. When the UDP helper function is disabled, all the specified UDP ports are disabled, including the default ports.
- You can specify up to 20 destination server addresses on a VLAN interface.

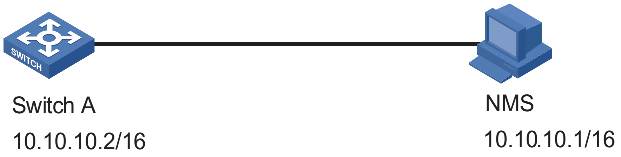
30 SNMP-RMON Configuration Guide

SNMP Configuration

The Simple Network Management Protocol (SNMP) is used for ensuring the transmission of the management information between any two network nodes. In this way, network administrators can easily retrieve and modify the information about any node on the network, locate and diagnose network problems, plan for network growth, and generate reports on network nodes.

Network Diagram

Figure 80 Network diagram for SNMP configuration



Networking and Configuration Requirements

- An NMS and Switch A (SNMP agent) are connected through the Ethernet. The IP address of the NMS is 10.10.10.1 and that of the VLAN interface on Switch A is 10.10.10.2.
- Perform the following configuration on Switch A: setting the community name and access right, administrator ID, contact and switch location, and enabling the switch to sent traps.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

Configuring the switch (SNMP agent)

# Enable SNMP agent, and set the SNMPv1 and SNMPv2c community names.

```
<3Com> system-view
[3Com] snmp-agent
[3Com] snmp-agent sys-info version all
[3Com] snmp-agent community read readname
[3Com] snmp-agent community write writename
```

# Set the access right of the NMS to the MIB of the SNMP agent.

```
[3Com] snmp-agent mib-view include internet 1.3.6.1
```

# For SNMPv3, set the SNMPv3 group and user, set the security level to authentication with privacy, authentication protocol to **HMAC-MD5**, authentication password to **passmd5**, encryption protocol to **DES**, and encryption password to **cfb128cfb128**.

```
[3Com] snmp-agent group v3 managev3group privacy write-view internet
[3Com] snmp-agent usm-user v3 managev3user managev3group authenticat
ion-mode md5 passmd5 privacy-mode des56 cfb128cfb128
```

# Configure the IP address of VLAN-interface 2 as 10.10.10.2. Add the port Ethernet 1/0/2 to VLAN 2.

```
[3Com] vlan 2
[3Com-vlan2] port Ethernet 1/0/2
[3Com-vlan2] quit
[3Com] interface Vlan-interface 2
[3Com-Vlan-interface2] ip address 10.10.10.2 255.255.255.0
[3Com-Vlan-interface2] quit
```

# Enable the sending of Traps to the NMS with an IP address of 10.10.10.1, using **public** as the community name.

```
[3Com] snmp-agent trap enable standard authentication
[3Com] snmp-agent trap enable standard coldstart
[3Com] snmp-agent trap enable standard linkup
[3Com] snmp-agent trap enable standard linkdown
[3Com] snmp-agent target-host trap address udp-domain 10.10.10.1 udp
-port 5000 params securityname public
```

Configuring the NMS

The Switch 5500 supports 3Com’s network management products. SNMPv3 adopts username and password authentication. When you use 3Com’s network management products, you need to set usernames and choose the security level. For each security level, you need to set authorization mode, authorization password, privacy mode, privacy password, and so on. In addition, you need to set timeout time and maximum retry times.

You can query and configure an Ethernet switch through the NMS.

Complete Configuration

```
#
 snmp-agent
 snmp-agent local-switch fabricid 800007DB00E0FC0000206877
 snmp-agent community read public
 snmp-agent community write private
 snmp-agent sys-info version all
 snmp-agent group v3 managev3group privacy write-view internet
 snmp-agent target-host trap address udp-domain 10.10.10.1 udp-port
5000 params securityname public
 snmp-agent mib-view included internet internet
 snmp-agent usm-user v3 managev3user managev3group authentication-mo
de md5 passmd5 privacy-mode des56 cfb128cfb128
```

Precautions

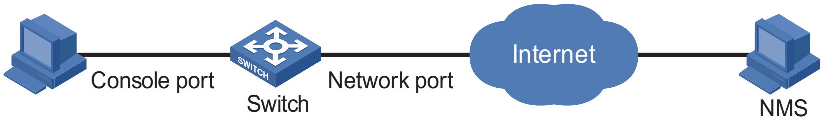
Authentication-related configuration on an NMS must be consistent with that on the devices for the NMS to manage the devices successfully.

RMON Configuration

Remote Monitoring (RMON) is a kind of MIB defined by Internet Engineering Task Force (IETF). It is an important enhancement to MIB II standards. RMON is mainly used to monitor the data traffic across a network segment or even the entire network, and is currently a commonly used network management standard.

Network Diagram

Figure 81 Network diagram for RMON configuration



Networking and Configuration Requirements

- Before performing RMON configuration, make sure the SNMP agents are correctly configured.
- The switch to be tested is connected to a terminal through the console port and to a remote NMS through the Internet. Create an entry in the extended alarm table to monitor the statistics on the Ethernet port. If the change rate of the entry exceeds the configured rising threshold or falling threshold, an alarm event will be triggered.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

Create the statistics entry numbered 1 to take statistics on Ethernet 1/0/1.

```
<3Com> system-view
[3Com] interface Ethernet 1/0/1
[3Com-Ethernet1/0/1] rmon statistics 1
[3Com-Ethernet1/0/1] quit
```

# Add the event entries numbered 1 and 2 to the event table, which will be triggered by the following extended alarms.

```
[3Com] rmon event 1 log
[3Com] rmon event 2 trap 10.21.30.55
```

# Add an entry numbered 2 to the extended alarm table to allow the system to calculate the alarm variables with the (.1.3.6.1.2.1.16.1.1.1.9.1+.1.3.6.1.2.1.16.1.1.1.10.1) formula to get the numbers of all the oversize and undersize packets received by Ethernet 1/0/1 that are in correct data format and sample the numbers in every 10 seconds. When the change ratio between samples reaches the rising threshold of 50, event 1 is triggered; when the change ratio drops under the falling threshold, event 2 is triggered. Set the sampling type to **forever** and the owner of the alarm table to **user1**.

```
[3Com] rmon prialarm 2 (.1.3.6.1.2.1.16.1.1.1.9.1+.1.3.6.1.2.1.16.1.
1.1.10.1) test 10 changeratio rising_threshold 50 1 falling_threshol
d 5 2 entrytype forever owner user1
```

Complete Configuration

```
#
 rmon event 1 description null log owner null
 rmon event 2 description null trap 10.21.30.55 owner null
 rmon prialarm 2 (.1.3.6.1.2.1.16.1.1.1.9.1+.1.3.6.1.2.1.16.1.1.1.10
.1) test 10 changeratio rising_threshold 50 1 falling_threshold 5 2
entrytype forever owner user1
#
interface Ethernet1/0/1
 rmon statistics 1 owner null
```

Precautions

None

31 NTP Configuration Guide

NTP Client/Server Mode Configuration

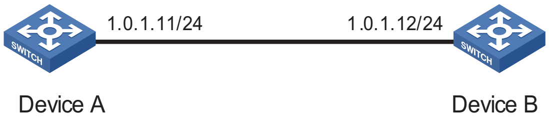
Defined in RFC 1305, the Network Time Protocol (NTP) synchronizes timekeeping among distributed time servers and clients. NTP runs over the User Datagram Protocol (UDP), using UDP port 123.

The purpose of using NTP is to keep consistent timekeeping among all clock-dependent devices within the network so that the devices can provide diverse applications based on the consistent time.

For a local system running NTP, its time can be synchronized by other reference sources and can be used as a reference source to synchronize other clocks.

Network Diagram

Figure 82 Network diagram for NTP client/server mode configuration



Networking and Configuration Requirements

- The local clock of Device A (switch) is to be used as a reference source, with the stratum level of 2.
- Device B is a Switch 5500, which takes Device A as the time server.
- Set Device B to work in the client mode, and Device A will automatically work in the server mode.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

Set Device B to take Device A as the time server.

```
<DeviceB> system-view
[DeviceB] ntp-service unicast-server 1.0.1.11
```

# View NTP status of Device B.

```
[DeviceB] display ntp-service status
```

# View NTP session information of Device B.

```
[DeviceB] display ntp-service sessions
```

Complete Configuration

```
#
 ntp-service unicast-server 1.0.1.11
```

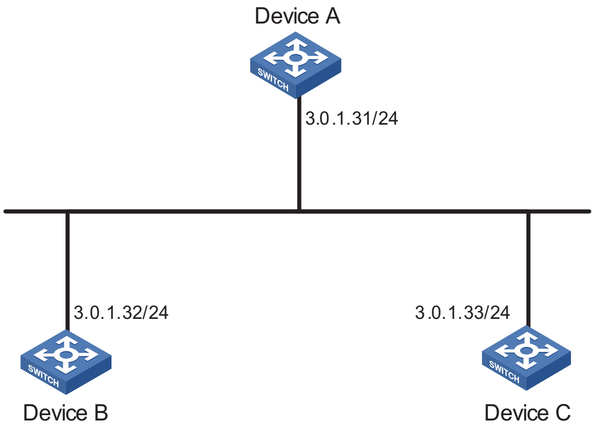
Precautions

The local clock of a 3Com Switch 5500, 5500G, or 4210 cannot be set as a reference clock. It can synchronize other devices as a reference clock only when its clock is synchronized.

NTP Symmetric Peers Mode Configuration

Network Diagram

Figure 83 Network diagram for NTP symmetric peers mode configuration



Networking and Configuration Requirements

- The local clock of Device A is to be used as a reference source, with the stratum level of 2.
- Device C is a Switch 5500 which takes Device A as the time server, and Device A automatically works in the server mode.
- The local clock of Device B is to be used as a reference source, with the stratum level of 1. Set Device B to take Device C as the symmetric-peer.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

- Configure Device C.

# Set Device A as the time server.

```
<DeviceC> system-view
[DeviceC] ntp-service unicast-server 3.0.1.31
```

- Configure Device B (after Device C is synchronized to Device A).

# Set Device C as the symmetric-peer.

```
<DeviceB> system-view
[DeviceB] ntp-service unicast-peer 3.0.1.33
```

# View NTP status and NTP session information of Device C after clock synchronization.

```
[DeviceC] display ntp-service status
[DeviceC] display ntp-service sessions
```

Complete Configuration

- Configuration on Device C.

```
#
ntp-service unicast-server 3.0.1.31
```

- Configuration on Device B.

```
#
ntp-service unicast-peer 3.0.1.33
```

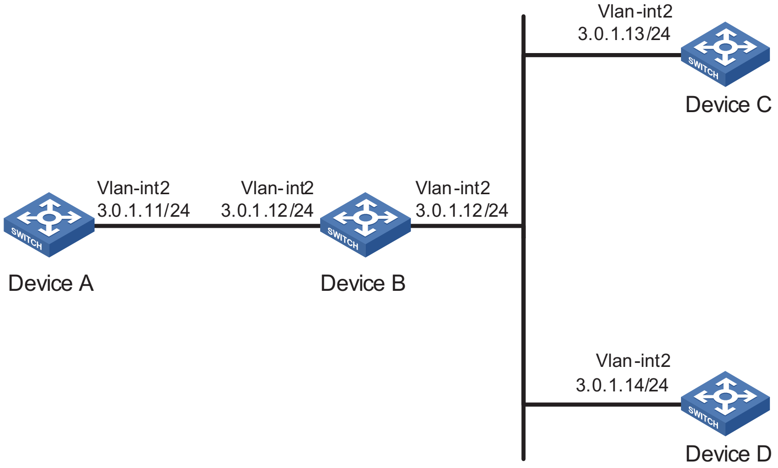
Precautions

The local clock of a Switch 5500, 5500G, or 4210 cannot be set as a reference clock. It can synchronize other devices as a reference clock only when its clock is synchronized.

NTP Broadcast Mode Configuration

Network Diagram

Figure 84 Network diagram for NTP broadcast mode configuration



Networking and Configuration Requirements

- The local clock of Device C is to be used as a reference source, with the stratum level of 2. Set Device C to work in the broadcast server mode and send broadcasts through its VLAN-interface 2.
- Device A and Device D are two Switch 5500s. Set Device A and Device D to work in the broadcast client mode and listen to broadcasts through their VLAN-interface 2 respectively.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

- Configure Device C.

# Set Device C to work as the broadcast sever and send broadcasts through its VLAN-interface 2.

```
<DeviceC> system-view
[DeviceC] interface Vlan-interface 2
[DeviceC-Vlan-interface2] ntp-service broadcast-server
```

- Configure Device A (perform the same configuration on Device D).

# Set Device A to work as the broadcast client and listen broadcasts through its VLAN-interface 2.

```
<DeviceA> system-view
[DeviceA] interface Vlan-interface 2
[DeviceA-Vlan-interface2] ntp-service broadcast-client
```

- View the NTP status and NTP session information of Device D after clock synchronization. (You can use the same command to view the NTP status and NTP session information of Device A)

# View NTP status of Device D.

```
[DeviceD] display ntp-service status
```

# View NTP session information of Device D.

```
[DeviceD] display ntp-service sessions
```

Complete Configuration

- Configuration on Device C.

```
#
interface Vlan-interface2
 ip address 3.0.1.13 255.255.255.0
 ntp-service broadcast-server
```

- Configuration on Device A.

```
#
interface Vlan-interface2
 ip address 3.0.1.11 255.255.255.0
 ntp-service broadcast-client
```

- Configuration on Device D.

```
#
interface Vlan-interface2
 ip address 3.0.1.14 255.255.255.0
 ntp-service broadcast-client
```

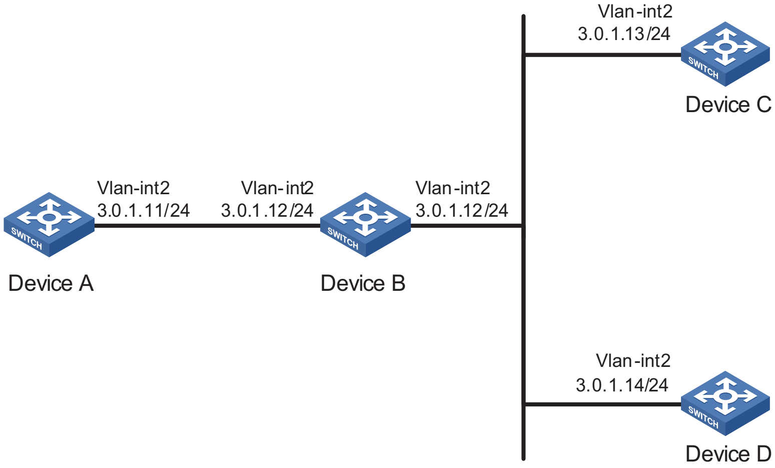
Precautions

The local clock of the Switch 5500, 5500G, or 4210 cannot be set as a reference clock. It can synchronize other devices as a reference clock only when its clock is synchronized.

NTP Multicast Mode Configuration

Network Diagram

Figure 85 Network diagram for NTP multicast mode configuration



Networking and Configuration Requirements

- The local clock of Device C is to be used as a reference source, with the stratum level of 2. Set Device C to work in the multicast server mode and send multicast through its VLAN-interface 2.
- Device A and Device D are Switch 5500s. Set Device A and Device D to work in the multicast client mode and listen to multicasts through their VLAN-interface 2 respectively.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

- Configure Device C.

# Set Device C to work as the multicast server and send multicasts through its VLAN-interface 2.

```
<DeviceC> system-view
[DeviceC] interface Vlan-interface 2
[DeviceC-Vlan-interface2] ntp-service multicast-server
```

- Configure Device A (perform the same configuration on Device D).

# Set Device A to work as the multicast client and listen multicasts through its VLAN-interface 2.

```
<DeviceA> system-view
[DeviceA] interface Vlan-interface 2
[DeviceA-Vlan-interface2] ntp-service multicast-client
```

- View the NTP status and NTP session information of Device D after clock synchronization (You can use the same command to view the NTP status and NTP session information of Device A).

# View NTP status of Device D.

```
[DeviceD] display ntp-service status
```

# View NTP session information of Device D.

```
[DeviceD] display ntp-service sessions
```

Complete Configuration

- Configuration on Device C.

```
#
interface Vlan-interface2
 ip address 3.0.1.13 255.255.255.0
 ntp-service multicast-server
```

- Configuration on Device A.

```
#
interface Vlan-interface2
 ip address 1.0.1.11 255.255.255.0
 ntp-service multicast-client
```

- Configuration on Device D.

```
#
interface Vlan-interface2
 ip address 3.0.1.14 255.255.255.0
 ntp-service multicast-client
```

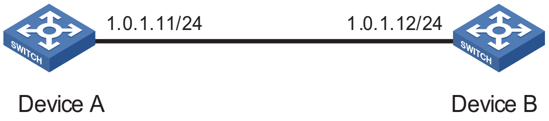
Precautions

The local clock of the Switch 5500, 5500G, or 4210 cannot be set as a reference clock. It can synchronize other devices as a reference clock only when its clock is synchronized.

NTP Client/Server Mode with Authentication Configuration

Network Diagram

Figure 86 Network diagram for NTP client/server mode with authentication configuration



Networking and Configuration Requirements

- The local clock of Device A is to be used as a reference source, with the stratum level of 2.

- Device B is a Switch 5500, which takes Device A as the time server and works in the client mode. Device A automatically works in the server mode.
- Configure NTP authentication between Device A and Device B.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

- Configure Device B.

# Set Device A as the time server.

```
<DeviceB> system-view
[DeviceB] ntp-service unicast-server 1.0.1.11
```

# Enable the NTP authentication function.

```
[DeviceB] ntp-service authentication enable
```

# Set MD5 key numbered **42**, with the key content **aNiceKey**.

```
[DeviceB] ntp-service authentication-keyid 42 authentication-mode md
5 aNiceKey
```

# Specify key 42 as a trusted key.

```
[DeviceB] ntp-service reliable authentication-keyid 42
[DeviceB] ntp-service unicast-server 1.0.1.11 authentication-keyid 42
```

- Configure Device A.

# Enable the NTP authentication function.

```
<DeviceA> system-view
[DeviceA] ntp-service authentication enable
```

# Set MD5 key numbered **42**, with the key content **aNiceKey**.

```
[DeviceA] ntp-service authentication-keyid 42 authentication-mode md
5 aNiceKey
```

# Specify key 42 as a trusted key.

```
[DeviceA] ntp-service reliable authentication-keyid 42
```

Complete Configuration

- Configuration on Device B.

```
#
 ntp-service authentication enable
 ntp-service authentication-keyid 42 authentication-mode md5 X&9#$^U
(!:[Q=^Q‘MAF4<1!!
 ntp-service reliable authentication-keyid 42
 ntp-service unicast-server 1.0.1.11
```

- Configuration on Device A.

```
#
 ntp-service authentication enable
 ntp-service authentication-keyid 42 authentication-mode md5 X&9#$^U
(!:[Q=^Q‘MAF4<1!!
 ntp-service reliable authentication-keyid 42
```

Precautions

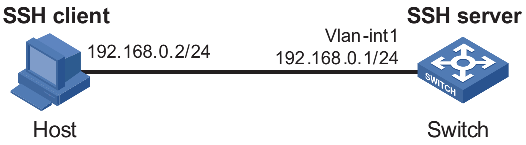
The local clock of the Switch 5500, 5500G, or 4210 cannot be set as a reference clock. It can synchronize other devices as a reference clock only when its clock is synchronized.

32 SSH Configuration Guide

Configuring the Switch to Act as the SSH Server and Use Password Authentication

Network Diagram

Figure 87 Network diagram for configuring the switch to act as the SSH server and use password authentication



Networking and Configuration Requirements

In scenarios where users log into a switch over an insecure network, SSH can be used to ensure the security of data exchange to the maximum extent. As shown in Figure 87, establish an SSH connection between the host (SSH client) and the switch (SSH server) for secure data exchange. The host runs SSH2 client software. Password authentication is required.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

- Configure the SSH server

# Create a VLAN interface on the switch and assign an IP address for it. The SSH client will use this address as the destination for SSH connection.

```
<3Com> system-view
[3Com] interface vlan-interface 1
[3Com-Vlan-interface1] ip address 192.168.0.1 255.255.255.0
[3Com-Vlan-interface1] quit
```

# Generate an RSA key pair.

```
[3Com] rsa local-key-pair create
```

# Set the authentication mode for the user interfaces to AAA.

```
[3Com] user-interface vty 0 4
[3Com-ui-vty0-4] authentication-mode scheme
```

# Enable the user interfaces to support SSH.

```
[3Com-ui-vty0-4] protocol inbound ssh
[3Com-ui-vty0-4] quit
```

# Create local user **client001**, and set the authentication password to **abc**, protocol type to SSH, and command privilege level to 3 for the user.

```
[3Com] local-user client001
[3Com-luser-client001] password simple abc
[3Com-luser-client001] service-type ssh level 3
[3Com-luser-client001] quit
```

# Specify the authentication method of user **client001** as **password**.

```
[3Com] ssh user client001 authentication-type password
```

- Configure the SSH client

# Configure an IP address (192.168.0.2 in this case) for the SSH client.

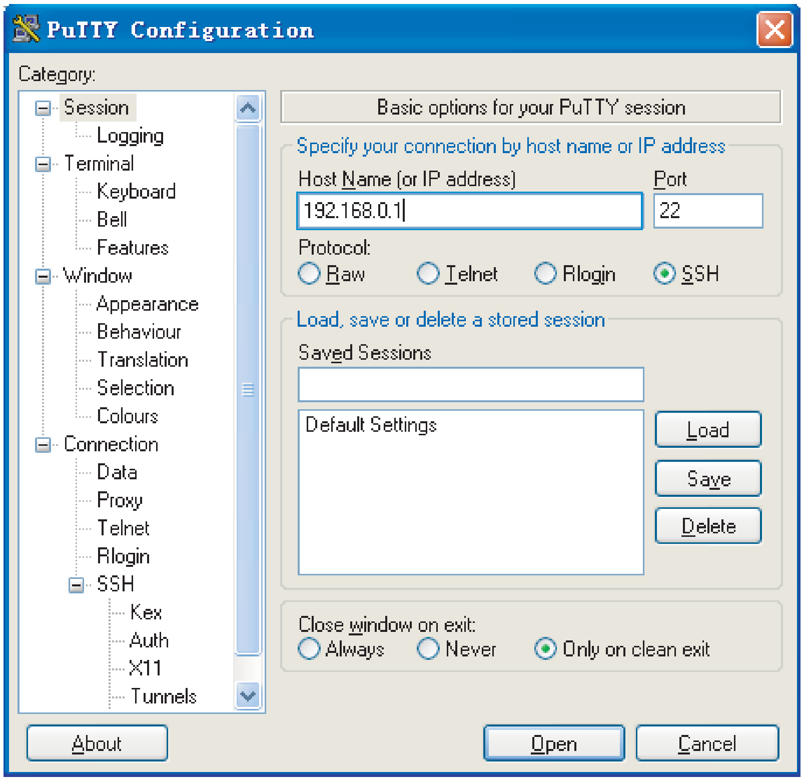
This IP address and that of the VLAN interface on the switch must be in the same network segment.

# Configure the SSH client software to establish a connection to the SSH server.

Take SSH client software PuTTY v0.58 as an example:

1 Run PuTTY.exe to enter the following configuration interface.

Figure 88 SSH client configuration interface



Host Name (or IP address): 192.168.0.1

Port: 22

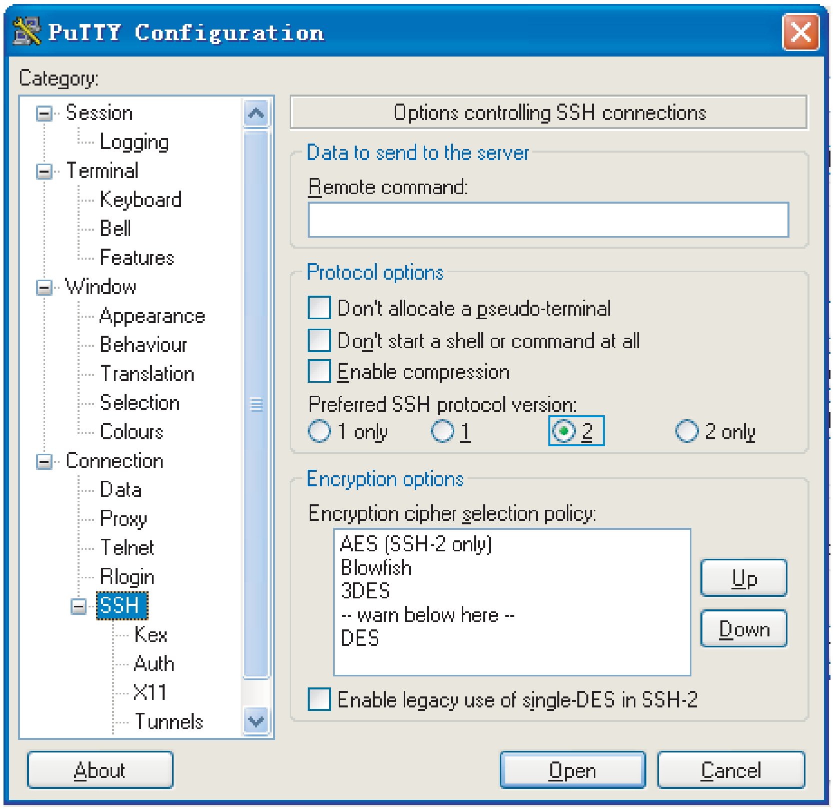
Protocol: ○ Raw ○ Telnet ○ Rlogin ● SSH

Close window on exit: ○ Always ○ Never ● Only on clean exit

In the **Host Name (or IP address)** text box, enter the IP address of the SSH server.

2 From the category on the left pane of the window, select **SSH** under **Connection**. The window as shown in Figure 89 appears.

Figure 89 SSH client configuration interface 2



Options controlling SSH connections

Data to send to the server

Remote command:

Protocol options

□ Don't allocate a pseudo-terminal

□ Don't start a shell or command at all

□ Enable compression

Preferred SSH protocol version:

○ 1 only ○ 1 ● 2 ○ 2 only

Encryption options

Encryption cipher selection policy:

AES (SSH-2 only)
Blowfish
3DES
-- warn below here --
DES

□ Enable legacy use of single-DES in SSH-2

Under **Protocol options**, select **2** from **Preferred SSH protocol version**.

3 As shown in Figure 89, click **Open**. If the connection is normal, you can enter the username **client001** and password **abc** at prompt. Once authentication succeeds, you will log onto the server.

Complete Configuration

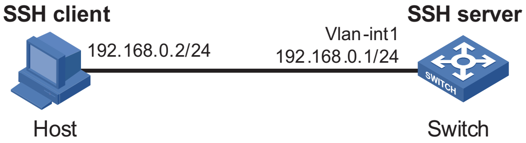
- Configure the SSH server

```
#
local-user client001
 password simple abc
 service-type ssh
 level 3
#
interface Vlan-interface1
 ip address 192.168.0.1 255.255.255.0
#
 ssh user client001 authentication-type password
 ssh user client001 service-type stelnet
#
user-interface vty 0 4
 authentication-mode scheme
 protocol inbound ssh
```

Configuring the Switch to Act as the SSH Server and Use RSA Authentication

Network Diagram

Figure 90 Network diagram for configuring the switch to act as the SSH server and use RSA authentication



Networking and Configuration Requirements

In scenarios where users log into a switch over an insecure network, SSH can be used to ensure the security of data exchange to the maximum extent. As shown in Figure 90, establish an SSH connection between the host (SSH client) and the switch (SSH server) for secure data exchange. The host runs SSH2 client software. RSA authentication is required.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

- Configure the SSH server

# Create a VLAN interface on the switch and assign an IP address for it. The SSH client will use this address as the destination for SSH connection.

```
<3Com> system-view
[3Com] interface vlan-interface 1
[3Com-Vlan-interface1] ip address 192.168.0.1 255.255.255.0
[3Com-Vlan-interface1] quit
```

# Generate an RSA key pair.

```
[3Com] rsa local-key-pair create
```

# Set the authentication mode for the user interfaces to AAA.

```
[3Com] user-interface vty 0 4
[3Com-ui-vty0-4] authentication-mode scheme
```

# Enable the user interfaces to support SSH.

```
[3Com-ui-vty0-4] protocol inbound ssh
```

# Set the client’s command privilege level to 3.

```
[3Com-ui-vty0-4] user privilege level 3
[3Com-ui-vty0-4] quit
```

# Configure the authentication method of the SSH client named **client001** as RSA.

```
[3Com] ssh user client001 authentication-type rsa
```

*Before performing the following steps, you must generate an RSA key pair by using the client software on the client, save the public key in a file named **public**, and then upload the file to the SSH server through FTP or TFTP. For details, refer to "Configure the SSH client" on page 284.*

# Import the client's public key named **Switch001** from file **public**.

```
[3Com] rsa peer-public-key Switch001 import sshkey public
```

# Assign the public key **Switch001** to client **client001**.

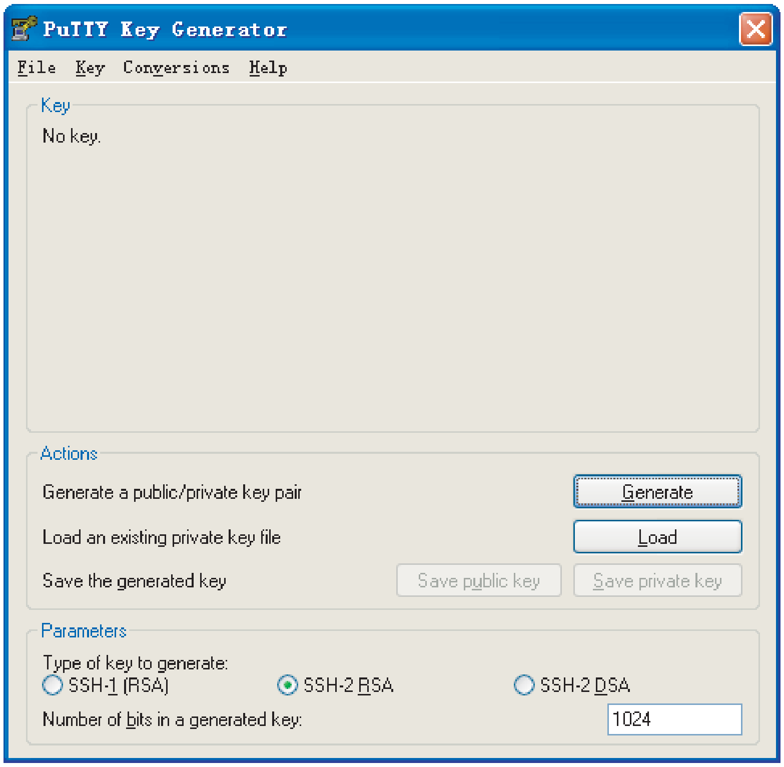
```
[3Com] ssh user client001 assign rsa-key Switch001
```

- Configure the SSH client

# Generate an RSA key pair, taking PuTTYGen as an example.

1 Run PuTTYGen.exe, choose **SSH-2 RSA** and click **Generate**.

Figure 91 Client key pair generation interface 1



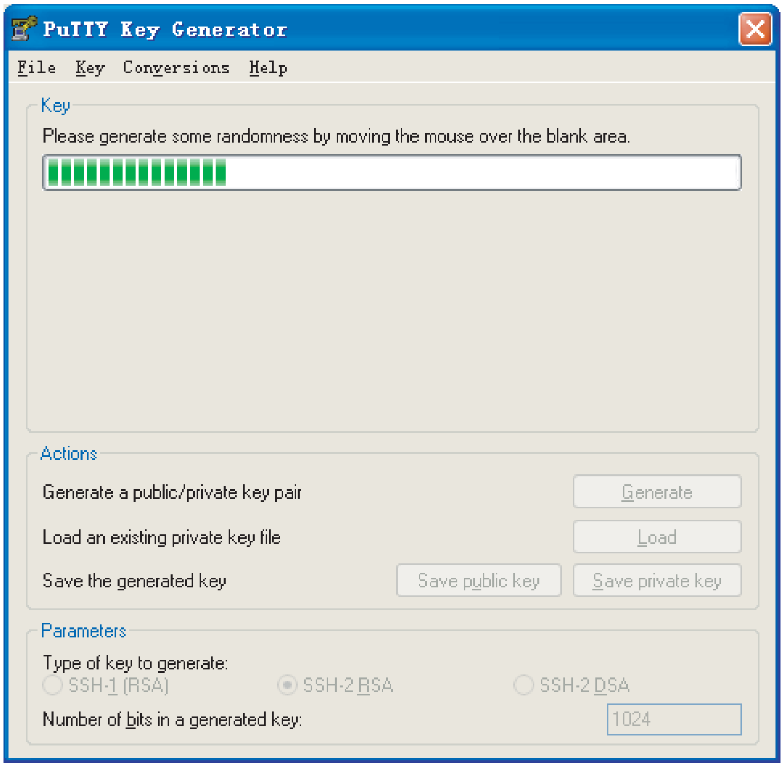
Key
No key.

Type of key to generate:
○ SSH-1 (RSA) ● SSH-2 RSA ○ SSH-2 DSA

Number of bits in a generated key: 1024

During the generation process, you must move the mouse continuously and keep the mouse off the green process bar shown in Figure 92. Otherwise, the process bar stops moving and the key pair generation process is stopped.

Figure 92 Client key pair generation interface 2



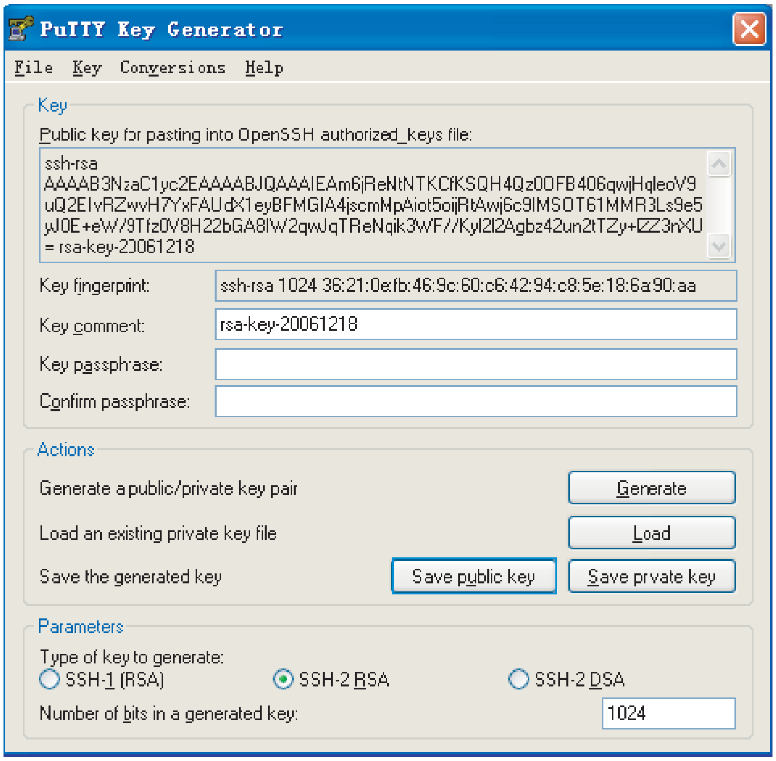
Please generate some randomness by moving the mouse over the blank area.

Type of key to generate:
○ SSH-1 (RSA) ● SSH-2 RSA ○ SSH-2 DSA

Number of bits in a generated key: 1024

After the key pair is generated, click **Save public key** and enter the name of the file for saving the public key (**public** in this case).

Figure 93 Client key pair generation interface 3



Key

Public key for pasting into OpenSSH authorized_keys file:

```
ssh-rsa
AAAAB3NzaC1yc2EAAAABJQAAAIEAm6jReNtNTKCfKSQH4Qz0OFB406qwjHqleoV9
uQ2ElvRZwvH7YxFAUdX1eyBFMGIA4jscmMpAiot5oijRtAwj6c9IMSOT61MMR3Ls9e5
yJ0E+eW/9Tfz0V8H22bGA8lW2qwJqTReNqik3WF//Kyl2l2Agbz42un2tTZy+lZZ3nXU
= rsa-key-20061218
```

Key fingerprint: ssh-rsa 1024 36:21:0e:fb:46:9c:60:c6:42:94:c8:5e:18:6a:90:aa

Key comment: rsa-key-20061218

Key passphrase:

Confirm passphrase:

Actions

Generate a public/private key pair

Load an existing private key file

Save the generated key

Parameters

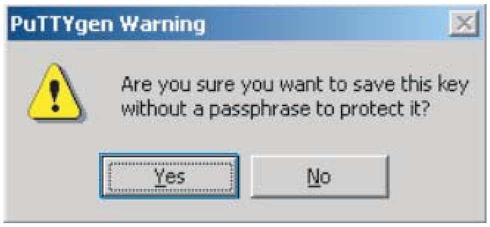
Type of key to generate:

○ SSH-1 (RSA) ● SSH-2 RSA ○ SSH-2 DSA

Number of bits in a generated key: 1024

Likewise, to save the private key, click **Save private key**. A warning window pops up to prompt you whether to save the private key without any protection. Click **Yes** and enter the name of the file for saving the private key (**private.ppk** in this case).

Figure 94 Client key pair generation interface 4



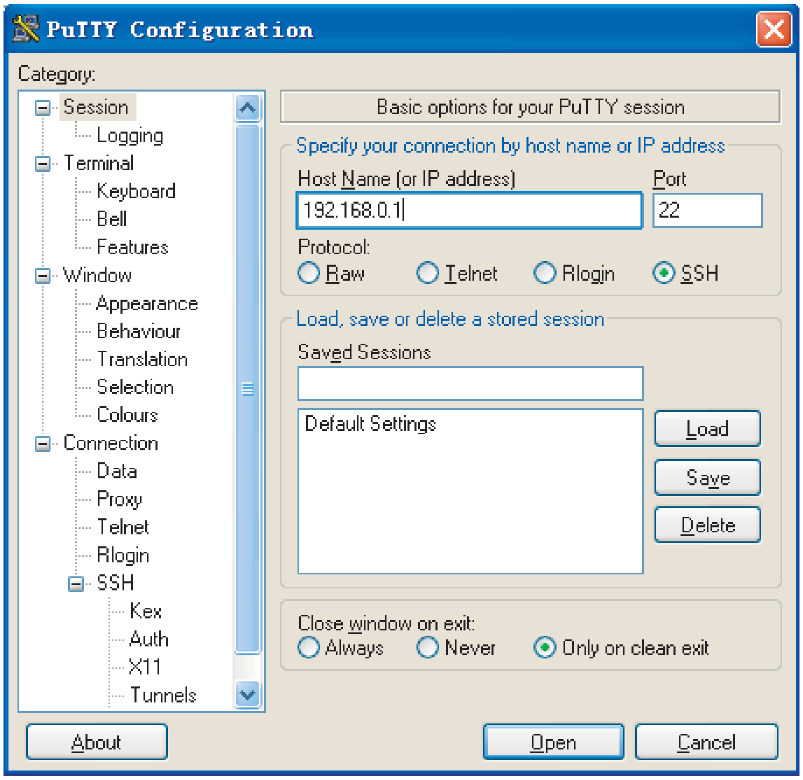
Are you sure you want to save this key without a passphrase to protect it?

# Configure the SSH client software to establish a connection to the SSH server.

Take SSH client software PuTTY v0.58 as an example:

1 Run PuTTY.exe to enter the following configuration interface.

Figure 95 SSH client configuration interface 1



Host Name (or IP address): 192.168.0.1

Port: 22

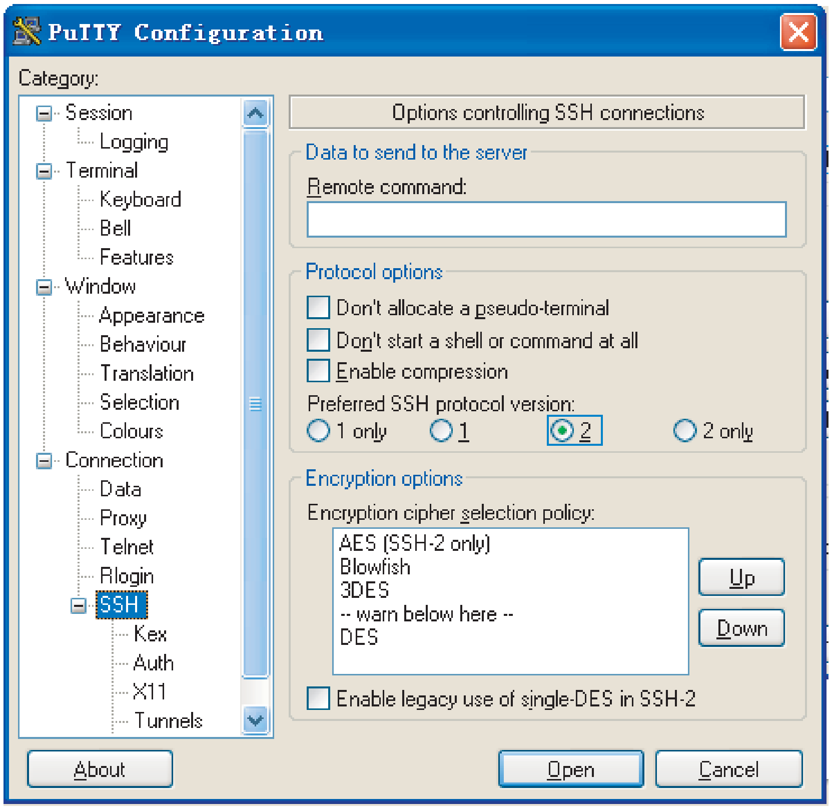
Protocol: ○ Raw ○ Telnet ○ Rlogin ● SSH

Close window on exit: ○ Always ○ Never ● Only on clean exit

In the **Host Name (or IP address)** text box, enter the IP address of the SSH server.

2 From the category on the left pane of the window, select **SSH** under **Connection**. The window as shown in Figure 96 appears.

Figure 96 SSH client configuration interface 2



Options controlling SSH connections

Data to send to the server

Remote command:

Protocol options

□ Don't allocate a pseudo-terminal

□ Don't start a shell or command at all

□ Enable compression

Preferred SSH protocol version:

○ 1 only ○ 1 ● 2 ○ 2 only

Encryption options

Encryption cipher selection policy:

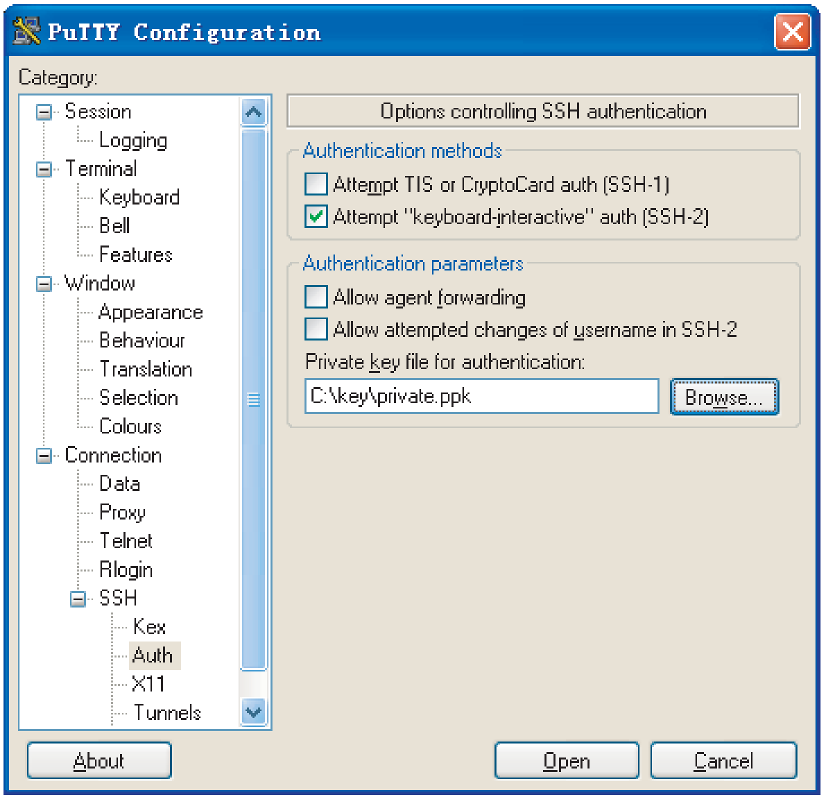
AES (SSH-2 only)
Blowfish
3DES
-- warn below here --
DES

□ Enable legacy use of single-DES in SSH-2

Under **Protocol options**, select **2** from **Preferred SSH protocol version**.

3 From the category, select **Connection/SSH/Auth**. The following window appears.

Figure 97 SSH client configuration interface 2



Options controlling SSH authentication

Authentication methods

- □ Attempt TIS or CryptoCard auth (SSH-1)
- ☑ Attempt "keyboard-interactive" auth (SSH-2)

Authentication parameters

- □ Allow agent forwarding
- □ Allow attempted changes of username in SSH-2

Private key file for authentication: C:\key\private.ppk

Click **Browse...** to bring up the file selection window, navigate to the private key file and click **OK**.

4 In the window shown in Figure 97, click **Open**. If the connection is normal, you will be prompted to enter the username.

Complete Configuration

- Configure the SSH server

```
#
interface Vlan-interface1
 ip address 192.168.0.1 255.255.255.0
#
 ssh user client001 assign rsa-key Switch001
 ssh user client001 authentication-type rsa
 ssh user client001 service-type stelnet
#
user-interface vty 0 4
 authentication-mode scheme
 user privilege level 3
 protocol inbound ssh
```

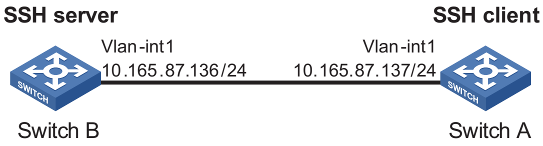
Precautions

When acting as an SSH server, the Switch 4210 does not support configuring the client host public key by importing from a public key file. You need to configure it manually.

Configuring the Switch to Act as the SSH Client and Use Password Authentication

Network Diagram

Figure 98 Network diagram for configuring the switch to act as the SSH client and use password authentication



Networking and Configuration Requirements

In scenarios where users log into a switch over an insecure network by using another switch, SSH can be used to ensure the security of data exchange to the maximum extent. As shown in Figure 98:

- Switch A acts as the SSH client and the login username is **client001**.
- Switch B acts as the SSH server, whose IP address is 10.165.87.136.
- Password authentication is required.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

- Configure Switch B

# Create a VLAN interface on the switch and assign an IP address for it. The SSH client will use this address as the destination for SSH connection.

```
<3Com> system-view
[3Com] interface vlan-interface 1
[3Com-Vlan-interface1] ip address 10.165.87.136 255.255.255.0
[3Com-Vlan-interface1] quit
```

# Generate an RSA key pair.

```
[3Com] rsa local-key-pair create
```

# Set the authentication mode for the user interfaces to AAA.

```
[3Com] user-interface vty 0 4
[3Com-ui-vty0-4] authentication-mode scheme
```

# Enable the user interfaces to support SSH.

```
[3Com-ui-vty0-4] protocol inbound ssh
[3Com-ui-vty0-4] quit
```

# Create local user **client001**, and set the authentication password to **abc**, protocol type to SSH, and command privilege level to 3 for the client.

```
[3Com] local-user client001
[3Com-luser-client001] password simple abc
[3Com-luser-client001] service-type ssh level 3
[3Com-luser-client001] quit
```

# Specify the authentication method of user **client001** as **password**.

```
[3Com] ssh user client001 authentication-type password
```

- Configure Switch A

# Create a VLAN interface on the switch and assign an IP address for it. This address will serve as the SSH client's address for SSH connection.

```
<3Com> system-view
[3Com] interface vlan-interface 1
[3Com-Vlan-interface1] ip address 10.165.87.137 255.255.255.0
[3Com-Vlan-interface1] quit
```

# Establish a connection to the server 10.165.87.136.

```
[3Com] ssh2 10.165.87.136
Username: client001
Trying 10.165.87.136 ...
Press CTRL+K to abort
Connected to 10.165.87.136 ...

The Server is not authenticated. Do you continue to access it?(Y/N):y
Do you want to save the server’s public key?(Y/N):n
Enter password:

**********************************************************************
*  Copyright(c) 2004-2007 Hangzhou 3Com Tech. Co., Ltd. All rights reserved.*
*  Without the owner’s prior written consent,                            *
*  no decompiling or reverse-switch fabricering shall be allowed.        *
**********************************************************************

<3Com>
```

Complete Configuration

- Configure Switch B

```
#
local-user client001
 password simple abc
 service-type ssh
 level 3
#
interface Vlan-interface1
 ip address 10.165.87.136 255.255.255.0
#
 ssh user client001 authentication-type password
 ssh user client001 service-type stelnet
#
user-interface vty 0 4
```

```
 authentication-mode scheme
 protocol inbound ssh
```

- Configure Switch A

```
#
interface Vlan-interface1
 ip address 10.165.87.137 255.255.255.0
#
```

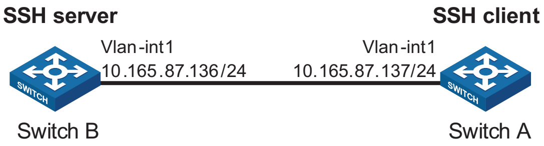
Precautions

None

Configuring the Switch to Act as the SSH Client and Use RSA Authentication

Network Diagram

Figure 99 Network diagram for configuring the switch to act as the SSH client and use RSA authentication



Networking and Configuration Requirements

In scenarios where users log into a switch over an insecure network by using another switch, SSH can be used to ensure the security of data exchange to the maximum extent. As shown in Figure 99:

- Switch A acts as the SSH client and the login username is **client001**.
- Switch B acts as the SSH server, whose IP address is 10.165.87.136.
- RSA authentication is required.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

- Configure Switch B

# Create a VLAN interface on the switch and assign an IP address for it. The SSH client will use this address as the destination for SSH connection.

```
<3Com> system-view
[3Com] interface vlan-interface 1
[3Com-Vlan-interface1] ip address 10.165.87.136 255.255.255.0
[3Com-Vlan-interface1] quit
```

# Generate an RSA key pair.

```
[3Com] rsa local-key-pair create
```

# Set the authentication mode for the user interfaces to AAA.

```
[3Com] user-interface vty 0 4
[3Com-ui-vty0-4] authentication-mode scheme
```

# Enable the user interfaces to support SSH.

```
[3Com-ui-vty0-4] protocol inbound ssh
```

# Set the client's command privilege level to 3.

```
[3Com-ui-vty0-4] user privilege level 3
[3Com-ui-vty0-4] quit
```

# Configure the authentication method of the SSH client named **client001** as RSA.

```
[3Com] ssh user client001 authentication-type rsa
```

After generating an RSA key pair on the SSH client, manually configure the RSA public key on the SSH server. For details, refer to "Configure Switch A" on page 293.

# Configure the client public key **Switch001**.

```
[3Com] rsa peer-public-key Switch001
RSA public key view: return to System View with "peer-public-key end".
[3Com-rsa-public-key] public-key-code begin
RSA key code view: return to last view with "public-key-code end".
[3Com-rsa-key-code] 3047
[3Com-rsa-key-code] 0240
[3Com-rsa-key-code] C8969B5A 132440F4 0BDB4E5E 40308747 804F608B
[3Com-rsa-key-code] 349EBD6A B0C75CDF 8B84DBE7 D5E2C4F8 AED72834
[3Com-rsa-key-code] 74D3404A 0B14363D D709CC63 68C8CE00 57C0EE6B
[3Com-rsa-key-code] 074C0CA9
[3Com-rsa-key-code] 0203
[3Com-rsa-key-code] 010001
[3Com-rsa-key-code] public-key-code end
[3Com-rsa-public-key] peer-public-key end
[3Com]
```

# Assign the public key **Switch001** to client **client001**.

```
[3Com] ssh user client001 assign rsa-key Switch001
```

- Configure Switch A

# Create a VLAN interface on the switch and assign an IP address for it. This address will serve as the SSH client's address for SSH connection.

```
<3Com> system-view
[3Com] interface vlan-interface 1
[3Com-Vlan-interface1] ip address 10.165.87.137 255.255.255.0
[3Com-Vlan-interface1] quit
```

# Generate an RSA key pair.

```
[3Com] rsa local-key-pair create
```

# Display the host public key.

```
<3Com> display rsa local-key-pair public

=====================================================
Time of Key pair created: 05:15:04  2006/12/08
Key name: 3Com_Host
Key type: RSA encryption Key
=====================================================
Key code:
3047
  0240
    C8969B5A 132440F4 0BDB4E5E 40308747 804F608B
    349EBD6A B0C75CDF 8B84DBE7 D5E2C4F8 AED72834
    74D3404A 0B14363D D709CC63 68C8CE00 57C0EE6B
    074C0CA9
  0203
    010001
Omitted
```

After generating a key pair on a client, you need to manually configure the host public key on the server and have the configuration on the server done before continuing configuration on the client.

# Establish a connection to the server 10.165.87.136.

```
[3Com] ssh2 10.165.87.136
Username: client001
Trying 10.165.87.136 ...
Press CTRL+K to abort
Connected to 10.165.87.136 ...

The Server is not authenticated. Do you continue to access it?(Y/N):y
Do you want to save the server's public key?(Y/N):n

**********************************************************************
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*  Without the owner's prior written consent,                             *
*  no decompiling or reverse-switch fabricering shall be allowed.         *
**********************************************************************

<3Com>
```

Complete Configuration

- Configure Switch B

```
#
 rsa peer-public-key Switch001
  public-key-code begin
   3047
     0240
       C8969B5A 132440F4 0BDB4E5E 40308747 804F608B 349EBD6A B0C75CD
F 8B84DBE7
       D5E2C4F8 AED72834 74D3404A 0B14363D D709CC63 68C8CE00 57C0EE6
B 074C0CA9
     0203
       010001
  public-key-code end
 peer-public-key end
#
interface Vlan-interface1
```

```
 ip address 10.165.87.136 255.255.255.0
#
 ssh user client001 assign rsa-key Switch001
 ssh user client001 authentication-type rsa
 ssh user client001 service-type stelnet
#
user-interface vty 0 4
 authentication-mode scheme
 user privilege level 3
 protocol inbound ssh
```

- Configure Switch A

```
#
interface Vlan-interface1
 ip address 10.165.87.137 255.255.255.0
#
```

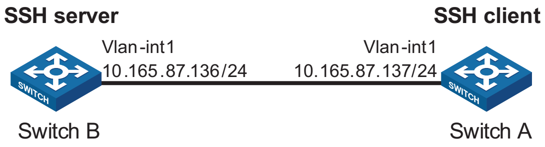
Precautions

None

Configuring the Switch to Act as the SSH Client and Not to Support First-Time Authentication

Network Diagram

Figure 100 Network diagram for configuring the switch to act as the SSH client and not to support first-time authentication



Networking and Configuration Requirements

In scenarios where users log into a switch over an insecure network by using another switch, SSH can be used to ensure the security of data exchange to the maximum extent. As shown in Figure 100:

- Switch A acts as the SSH client and the login username is **client001**.
- Switch B acts as the SSH server, whose IP address is 10.165.87.136.
- RSA authentication is required.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

- Configure Switch B

# Create a VLAN interface on the switch and assign an IP address for it. The SSH client will use this address as the destination for SSH connection.

```
<3Com> system-view
[3Com] interface vlan-interface 1
[3Com-Vlan-interface1] ip address 10.165.87.136 255.255.255.0
[3Com-Vlan-interface1] quit
```

# Generate an RSA key pair.

```
[3Com] rsa local-key-pair create
```

# Set the authentication mode for the user interfaces to AAA.

```
[3Com] user-interface vty 0 4
[3Com-ui-vty0-4] authentication-mode scheme
```

# Enable the user interfaces to support SSH.

```
[3Com-ui-vty0-4] protocol inbound ssh
```

# Set the client's command privilege level to 3.

```
[3Com-ui-vty0-4] user privilege level 3
[3Com-ui-vty0-4] quit
```

# Configure the authentication method of the SSH client named **client001** as RSA.

```
[3Com] ssh user client001 authentication-type rsa
```

After generating an RSA key pair on the SSH client, manually configure the RSA public key on the SSH server. For details, refer to "Configure Switch A" on page 297.

# Configure the client public key Switch001.

```
[3Com] rsa peer-public-key Switch001
RSA public key view: return to System View with "peer-public-key end".
[3Com-rsa-public-key] public-key-code begin
RSA key code view: return to last view with "public-key-code end".
[3Com-rsa-key-code] 3047
[3Com-rsa-key-code] 0240
[3Com-rsa-key-code] C8969B5A 132440F4 0BDB4E5E 40308747 804F608B
[3Com-rsa-key-code] 349EBD6A B0C75CDF 8B84DBE7 D5E2C4F8 AED72834
[3Com-rsa-key-code] 74D3404A 0B14363D D709CC63 68C8CE00 57C0EE6B
[3Com-rsa-key-code] 074C0CA9
[3Com-rsa-key-code] 0203
[3Com-rsa-key-code] 010001
[3Com-rsa-key-code] public-key-code end
[3Com-rsa-public-key] peer-public-key end
[3Com]
```

# Assign the public key Switch001 to client client001.

```
[3Com] ssh user client001 assign rsa-key Switch001
```

When the switch acting as the SSH client does not support first-time authentication, you need to manually configure the server host public key on it.

# Display the server host public key.

```
[3Com] display rsa local-key-pair public

=====================================================
Time of Key pair created: 09:04:41  2000/04/04
Key name: 3Com_Host
Key type: RSA encryption Key
=====================================================
Key code:
308188
  028180
    C9330FFD 2E2A606F 3BFD5554 8DACDFB8 4D754E86
    FC2D15E8 1996422A 0F6A2A6A A94A207E 1E25F3F9
    E0EA01A2 4E0F2FF7 B1D31505 39F02333 E443EE74
    5C3615C3 E5B3DC91 D41900F0 2AE8B301 E55B1420
    024ECF2C 28A6A454 C27449E0 46EB1EAF 8A918D33
    BAF53AF3 63B1FB17 F01E4933 00BE2EEA A272CD78
    C289B7DD 2BE0F7AD
  0203
    010001
Omitted
```

- Configure Switch A

# Create a VLAN interface on the switch and assign an IP address for it. This address will serve as the SSH client's address for SSH connection.

```
<3Com> system-view
[3Com] interface vlan-interface 1
[3Com-Vlan-interface1] ip address 10.165.87.137 255.255.255.0
[3Com-Vlan-interface1] quit
```

# Generate an RSA key pair.

```
[3Com] rsa local-key-pair create
```

# Display the client host public key.

```
<3Com> display rsa local-key-pair public

=====================================================
Time of Key pair created: 05:15:04  2006/12/08
Key name: 3Com_Host
Key type: RSA encryption Key
=====================================================
Key code:
3047
  0240
    C8969B5A 132440F4 0BDB4E5E 40308747 804F608B
    349EBD6A B0C75CDF 8B84DBE7 D5E2C4F8 AED72834
    74D3404A 0B14363D D709CC63 68C8CE00 57C0EE6B
    074C0CA9
  0203
    010001
Omitted
```

After generating a key pair on a client, you need to manually configure the host public key on the server and have the configuration on the server done before continuing configuration on the client.

# Disable first-time authentication.

```
[3Com] undo ssh client first-time
```

When the switch acting as the SSH client does not support first-time authentication, you need to manually configure the server host public key on it.

# Configure the server public key **Switch002** on the client.

```
[3Com] rsa peer-public-key Switch002
RSA public key view: return to System View with "peer-public-key end".
[3Com-rsa-public-key] public-key-code begin
RSA key code view: return to last view with "public-key-code end".
[3Com-rsa-key-code] 308188
[3Com-rsa-key-code] 028180
[3Com-rsa-key-code] C9330FFD 2E2A606F 3BFD5554 8DACDFB8 4D754E86
[3Com-rsa-key-code] FC2D15E8 1996422A 0F6A2A6A A94A207E 1E25F3F9
[3Com-rsa-key-code] E0EA01A2 4E0F2FF7 B1D31505 39F02333 E443EE74
[3Com-rsa-key-code] 5C3615C3 E5B3DC91 D41900F0 2AE8B301 E55B1420
[3Com-rsa-key-code] 024ECF2C 28A6A454 C27449E0 46EB1EAF 8A918D33
[3Com-rsa-key-code] BAF53AF3 63B1FB17 F01E4933 00BE2EEA A272CD78
[3Com-rsa-key-code] C289B7DD 2BE0F7AD
[3Com-rsa-key-code] 0203
[3Com-rsa-key-code] 010001
[3Com-rsa-key-code] public-key-code end
[3Com-rsa-public-key] peer-public-key end
[3Com]
```

# Specify the server public key on the client.

```
[3Com] ssh client 10.165.87.136 assign rsa-key Switch002
```

# Establish a connection to the server 10.165.87.136.

```
[3Com] ssh2 10.165.87.136
Username: client001
Trying 10.165.87.136 ...
Press CTRL+K to abort
Connected to 10.165.87.136 ...

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*  Without the owner’s prior written consent,                               *
*  no decompiling or reverse-switch fabricering shall be allowed.           *
**********************************************************************

<3Com>
```

Complete Configuration

- Configure Switch B

```
#
 rsa peer-public-key Switch001
  public-key-code begin
   3047
     0240
       C8969B5A 132440F4 0BDB4E5E 40308747 804F608B 349EBD6A B0C75CD
F 8B84DBE7
```

```
       D5E2C4F8 AED72834 74D3404A 0B14363D D709CC63 68C8CE00 57C0EE6
B 074C0CA9
     0203
       010001
  public-key-code end
 peer-public-key end
#
vlan 1
#
interface Vlan-interface1
 ip address 10.165.87.136 255.255.255.0
#
 ssh user client001 assign rsa-key Switch001
 ssh user client001 authentication-type RSA
 ssh user client001 service-type stelnet
#
user-interface vty 0 4
 authentication-mode scheme
 user privilege level 3
 protocol inbound ssh
```

- Configure Switch A

```
#
 rsa peer-public-key Switch002
  public-key-code begin
   308188
     028180
       C9330FFD 2E2A606F 3BFD5554 8DACDFB8 4D754E86 FC2D15E8 1996422
A 0F6A2A6A
       A94A207E 1E25F3F9 E0EA01A2 4E0F2FF7 B1D31505 39F02333 E443EE7
4 5C3615C3
       E5B3DC91 D41900F0 2AE8B301 E55B1420 024ECF2C 28A6A454 C27449E
0 46EB1EAF
       8A918D33 BAF53AF3 63B1FB17 F01E4933 00BE2EEA A272CD78 C289B7D
D 2BE0F7AD
     0203
       010001
  public-key-code end
 peer-public-key end
#
interface Vlan-interface1
 ip address 10.165.87.137 255.255.255.0
#
 undo ssh client first-time
 ssh client 10.165.87.136 assign rsa-key Switch002
#
```

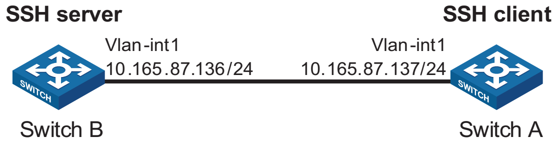
Precautions

None

Configuring SFTP

Network Diagram

Figure 101 Network diagram for configuring SFTP



Networking and Configuration Requirements

As shown in Figure 101, establish an SSH connection between the SFTP client (Switch A) and the SFTP server (Switch B). Log in to Switch B with the username **client001** and password **abc** through Switch A to manage and transfer files.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

- Configure the SFTP server (Switch B)

# Generate an RSA key pair.

```
<3Com>system-view
[3Com] rsa local-key-pair create
```

# Create a VLAN interface on the switch and assign an IP address for it. The SSH client will use this address as the destination for SSH connection.

```
[3Com] interface vlan-interface 1
[3Com-Vlan-interface1] ip address 192.168.0.1 255.255.255.0
[3Com-Vlan-interface1] quit
```

# Set the authentication mode for the user interfaces to AAA.

```
[3Com] user-interface vty 0 4
[3Com-ui-vty0-4] authentication-mode scheme
```

# Enable the user interfaces to support SSH.

```
[3Com-ui-vty0-4] protocol inbound ssh
[3Com-ui-vty0-4] quit
```

# Create a local user named **client001**.

```
[3Com] local-user client001
[3Com-luser-client001] password simple abc
[3Com-luser-client001] service-type ssh
[3Com-luser-client001] quit
```

# Configure the authentication method as **password**.

```
[3Com] ssh user client001 authentication-type password
```

# Specify the service type as SFTP.

```
[3Com] ssh user client001 service-type sftp
```

# Enable the SFTP server.

```
[3Com] sftp server enable
```

- Configure the SFTP client (Switch A)

# Create a VLAN interface on the switch and assign an IP address for it. This address must be in the same segment with the IP address of the VLAN interface on switch B. In this example, configure it as 192.168.0.2.

```
<3Com> system-view
[3Com] interface vlan-interface 1
[3Com-Vlan-interface1] ip address 192.168.0.2 255.255.255.0
[3Com-Vlan-interface1] quit
```

# Connect to the remote SFTP server using the username **client001** and password **abc** to enter SFTP client view.

```
[3Com] sftp 192.168.0.1
Input Username: client001
Trying 192.168.0.1 ...
Press CTRL+K to abort
Connected to 192.168.0.1 ...

The Server is not authenticated. Do you continue access it? [Y/N]:y
Do you want to save the server’s public key? [Y/N]:n
Enter password:

sftp-client>
```

# Display the current directory of the server, delete the file **z** and verify the deletion.

```
sftp-client> dir
-rwxrwxrwx   1 noone    nogroup      1759 Aug 23 06:52 config.cfg
-rwxrwxrwx   1 noone    nogroup       225 Aug 24 08:01 pubkey2
-rwxrwxrwx   1 noone    nogroup       283 Aug 24 07:39 pubkey1
drwxrwxrwx   1 noone    nogroup         0 Sep 01 06:22 new
-rwxrwxrwx   1 noone    nogroup       225 Sep 01 06:55 pub
-rwxrwxrwx   1 noone    nogroup         0 Sep 01 08:00 z
sftp-client> delete z
The following files will be deleted:
flash:/z
Are you sure to delete it?(Y/N):y
This operation may take a long time.Please wait...

File successfully Removed
sftp-client> dir
-rwxrwxrwx   1 noone    nogroup      1759 Aug 23 06:52 config.cfg
-rwxrwxrwx   1 noone    nogroup       225 Aug 24 08:01 pubkey2
-rwxrwxrwx   1 noone    nogroup       283 Aug 24 07:39 pubkey1
```

```
drwxrwxrwx   1 noone    nogroup         0 Sep 01 06:22 new
-rwxrwxrwx   1 noone    nogroup       225 Sep 01 06:55 pub
```

# Add a directory named **new1**, and then check that the new directory has been successfully created.

```
sftp-client> mkdir new1
New directory created
sftp-client> dir
-rwxrwxrwx   1 noone    nogroup      1759 Aug 23 06:52 config.cfg
-rwxrwxrwx   1 noone    nogroup       225 Aug 24 08:01 pubkey2
-rwxrwxrwx   1 noone    nogroup       283 Aug 24 07:39 pubkey1
drwxrwxrwx   1 noone    nogroup         0 Sep 01 06:22 new
-rwxrwxrwx   1 noone    nogroup       225 Sep 01 06:55 pub
drwxrwxrwx   1 noone    nogroup         0 Sep 02 06:30 new1
```

# Rename the directory to **new2**, and then verify the operation.

```
sftp-client> rename new1 new2
File successfully renamed
sftp-client> dir
-rwxrwxrwx   1 noone    nogroup      1759 Aug 23 06:52 config.cfg
-rwxrwxrwx   1 noone    nogroup       225 Aug 24 08:01 pubkey2
-rwxrwxrwx   1 noone    nogroup       283 Aug 24 07:39 pubkey1
drwxrwxrwx   1 noone    nogroup         0 Sep 01 06:22 new
-rwxrwxrwx   1 noone    nogroup       225 Sep 01 06:55 pub
drwxrwxrwx   1 noone    nogroup         0 Sep 02 06:33 new2
```

# Download the file **pubkey2** from the server, renaming it to **public**.

```
sftp-client> get pubkey2 public
This operation may take a long time, please wait...

Remote  file:flash:/pubkey2 --->  Local file: public..

Downloading file successfully ended
```

# Upload file **pu** to the server and rename it to **puk**, and then verify the operation.

```
sftp-client> put pu puk
This operation may take a long time, please wait...
Local file: pu --->  Remote file: flash:/puk
Uploading file successfully ended
sftp-client> dir
-rwxrwxrwx   1 noone    nogroup      1759 Aug 23 06:52 config.cfg
-rwxrwxrwx   1 noone    nogroup       225 Aug 24 08:01 pubkey2
-rwxrwxrwx   1 noone    nogroup       283 Aug 24 07:39 pubkey1
drwxrwxrwx   1 noone    nogroup         0 Sep 01 06:22 new
drwxrwxrwx   1 noone    nogroup         0 Sep 02 06:33 new2
-rwxrwxrwx   1 noone    nogroup       283 Sep 02 06:35 pub
-rwxrwxrwx   1 noone    nogroup       283 Sep 02 06:36 puk
sftp-client>
```

# Exit SFTP.

```
sftp-client> quit
Bye
```

Complete Configuration

- Configure Switch B

```
#
local-user client001
 password simple abc
 service-type ssh
#
interface Vlan-interface1
 ip address 192.168.0.1 255.255.255.0
#
 sftp server enable
 ssh user client001 authentication-type password
 ssh user client001 service-type sftp
#
user-interface vty 0 4
 authentication-mode scheme
 user privilege level 3
 protocol inbound ssh
#
```

- Configure Switch A

```
#
interface Vlan-interface1
 ip address 192.168.0.2 255.255.255.0
```

Precautions

None

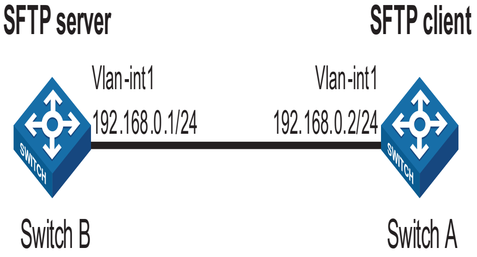
33 FTP AND TFTP CONFIGURATION GUIDE

Configuring a Switch as FTP Server

The Ethernet switch can act as an FTP server to provide file transfer services. You can run FTP client software on a PC to log into the FTP server to access the files on the server. Note that you need to configure the IP address of the FTP server correctly for the server to provide FTP services.

Network Diagram

Figure 102 Network diagram for configuring a switch as FTP server



Networking and Configuration Requirements

A switch operates as an FTP server and a remote PC as an FTP client.

- Configure the IP address of VLAN-interface 1 on the switch as 1.1.1.1/16, and that of the PC as 2.2.2.2/16. Ensure that the switch and PC can reach each other.
- Create an FTP user with the username **switch** and the password **hello** on the FTP server.
- An application named **switch.bin** is stored on the PC. The PC uploads the application to the switch through FTP to implement switch application upgrade.
- The PC downloads the configuration file **config.cfg** from the switch for backup.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

- Configure the switch

# Assign IP address 1.1.1.1/16 to VLAN-interface 1. (You can log in to the switch through the Console port. For detailed information, refer to “Logging in through the Console Port” in the *Configuration Guide* for your product.)

```
<3Com>
<3Com> system-view
[3Com] interface Vlan-interface 1
[3Com-Vlan-interface1] ip address 1.1.1.1 16
[3Com-Vlan-interface1] quit
```

# Enable the FTP server function, and configure the username and password for the FTP client to access FTP services.

```
[3Com] ftp server enable
[3Com] local-user switch
[3Com-luser-switch] password simple hello
[3Com-luser-switch] service-type ftp
```

- Run an FTP client application on the PC to connect to the FTP server.

The following takes the command line window tool provided by Windows as an example:

# Enter the command line window and browse to the directory where the file **switch.bin** is located. In this example it is in the root directory of C:.

```
C:\>
```

# Access the Ethernet switch through FTP. Input the username **switch** and password **hello** to log in and enter FTP view.

```
C:\> ftp 1.1.1.1
ftp>
```

# Switch data transfer mode to binary.

```
[ftp] binary
```

3Com recommends that you set the transfer mode to binary before performing data transfer operation, so as to ensure that the device can receive data normally.

```
ftp> put switch.bin
```

# Download file **config.cfg**.

```
ftp> get config.cfg
```

- Upgrade the application of the switch.

# Use the **boot boot-loader** command to specify the uploaded application to be the startup file for next startup and restart the switch to complete the switch application upgrade.

```
<3Com> boot boot-loader switch.bin
<3Com> reboot
```

Complete Configuration

Configure the switch

```
#
local-user switch
 password simple hello
 service-type ftp
#
vlan 1
#
interface Vlan-interface1
 ip address 1.1.1.1 255.255.0.0

#
 FTP server enable
```

Precautions

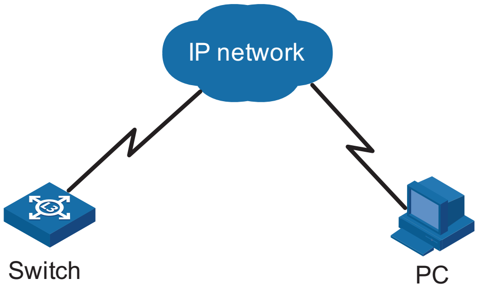
- If the free Flash memory of the switch is not enough for the application file to be uploaded, remove those unused applications from the Flash memory first.
- It is not recommended to directly remove applications in use. If removing some applications in use is a must to get enough space, you can use the BootROM menu to remove them.

Configuring a Switch as FTP Client

The Ethernet switch can act as an FTP client. You can use an emulation program or Telnet to log in to the switch and then use the **ftp** command to log in the FTP server and access the files on the server.

Network Diagram

Figure 103 Network diagram for configuring a switch as FTP client



Networking and Configuration Requirements

A switch operates as an FTP client and a remote PC as the FTP server.

- Configure the IP address of VLAN-interface 1 on the switch as 1.1.1.1/16, and that of the PC as 2.2.2.2/16. Ensure that the switch and PC can reach each other.
- Create an FTP user with the username **switch** and password **hello** on the FTP server, and allow the user to read and write under the directory **switch** of the PC.
- An application named **switch.bin** is stored on the PC. The switch downloads **switch.bin** from the PC through FTP to upgrade the application.
- The switch uploads the configuration file **config.cfg** to the PC for backup.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

- Perform FTP service-related configurations on the PC, that is, create a user account on the FTP server with the username **switch** and password **hello**. For detailed configuration, refer to the configuration instruction of the FTP server software.
- Configure the switch

# Assign IP address 1.1.1.1/16 to VLAN-interface 1. (You can log in to the switch through the Console port. For detailed information, see "Logging in through the Console Port" in the *Configuration Guide* for your product.)

```
<3Com>
<3Com> system-view
[3Com] interface Vlan-interface 1
[3Com-Vlan-interface1] ip address 1.1.1.1 16
[3Com-Vlan-interface1] return
```

# Connect to the FTP server using the **ftp** command in user view. You need to provide the username and password to log in to the FTP server.

```
<3Com> ftp 2.2.2.2
[ftp]
```

# Switch data transfer mode to binary.

```
[ftp] binary
```

You are recommended to set the transfer mode to binary before performing data transfer operation, so as to ensure that the device can receive data normally.

# Browse to the authorized directory on the FTP server, upload configuration file **config.cfg** to the FTP server, and download the file named **switch.bin**. Then, terminate the FTP connection and return to user view.

Before downloading a file, use the dir command to check that the remaining space of the Flash memory is enough for the file to be downloaded.

```
[ftp] cd switch
[ftp] put config.cfg
[ftp] get switch.bin
[ftp] quit
<3Com>
```

# Use the **boot boot-loader** command to specify the downloaded file as the application for next startup and then restart the switch. Thus the switch application is upgraded.

```
<3Com> boot boot-loader switch.bin
<3Com> reboot
```

Complete Configuration

```
#
vlan 1
#
interface Vlan-interface1
 ip address 1.1.1.1 255.255.0.0
```

Precautions

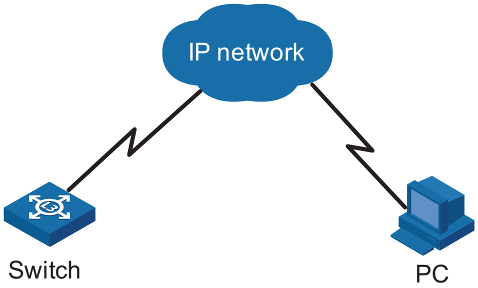
- If the free Flash memory of the switch is not enough for downloading the application file from the FTP server, remove those unused applications from the Flash memory before downloading the file.
- It is not recommended to directly remove applications in use. If removing some applications in use is a must to get enough space, you can use the BootROM menu to remove them.

Configuring a Switch as TFTP Client

Compared with FTP, Trivial File Transfer Protocol (TFTP) features simple interactive interface with no authentication control and is therefore applicable to the networks where client-server interactions are relatively simple.

Network Diagram

Figure 104 Network diagram for configuring a switch as TFTP client



Networking and Configuration Requirements

A switch operates as a TFTP client and a remote PC as a TFTP server.

- Configure the IP address of VLAN-interface 1 on the switch as 1.1.1.1/16, and that of the PC as 2.2.2.2/16. The switch and PC can reach each other.
- An application named **switch.bin** is stored on the PC. The switch downloads **switch.bin** through TFTP to upgrade the application.
- The switch uploads the configuration file **config.cfg** to the PC for backup.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

- Configure the TFTP working folder on the TFTP server. For detailed configurations, refer to the usage instructions about the TFTP server software.

- Configure the TFTP client (the switch):

# Assign IP address 1.1.1.1/16 to VLAN-interface 1. (You can log in to the switch through the Console port. For detailed information, see “Logging in through the Console Port” in the *Configuration Guide* for your product.)

```
<3Com>
<3Com> system-view
[3Com] interface Vlan-interface 1
[3Com-Vlan-interface1] ip address 1.1.1.1 16
[3Com-Vlan-interface1] return
```

# Download the switch application named **switch.bin** from the TFTP server to the switch, and upload the switch configuration file named **config.cfg** to the TFTP server.

```
<3Com> tftp 2.2.2.2 get switch.bin switch.bin
<3Com> tftp 2.2.2.2 put config.cfg config.cfg
```

# Use the **boot boot-loader** command to specify the downloaded file to be the startup file for next startup of the switch and restart the switch to complete the switch application upgrade.

```
<3Com> boot boot-loader switch.bin
<3Com> reboot
```

Complete Configuration

Configure the switch

```
#
vlan 1
#
interface Vlan-interface1
ip address 1.1.1.1 255.255.0.0
```

Precautions

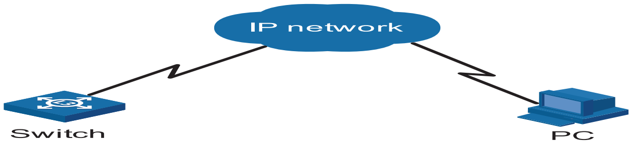
- If the free Flash memory of the switch is not enough for downloading the application file from the TFTP server, remove those unused applications from the Flash memory before downloading the file.
- It is not recommended to directly remove applications in use. If removing some applications in use is a must to get enough space, you can use the BootROM menu to remove them.

34 INFORMATION CENTER CONFIGURATION GUIDE

Outputting Log Information to a Unix Log Host

Network Diagram

Figure 105 Network diagram for outputting log information to a Unix log host



Networking and Configuration Requirements

Send log information with severity higher than **informational** to a Unix log host with an IP address of 202.38.1.10. The information source modules are ARP and IP.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

- Configuration on the switch.

# Enable the information center.

```
<3Com> system-view
[3Com] info-center enable
```

# By default, the system outputs information of all modules to the loghost channel. To obtain the system information of the ARP and IP modules, you need to disable the output of information of all modules to the log host.

```
[3Com] undo info-center source default channel loghost
```

# Set the host with an IP address of 202.38.1.10 to be the log host, set the severity to **informational**, and the information source modules to ARP and IP.

```
[3Com] info-center loghost 202.38.1.10 facility local4
[3Com] info-center source arp channel loghost log level informationa
l debug state off trap state off
```

```
[3Com] info-center source ip channel loghost log level informational
 debug state off trap state off
```

- Configuration on the log host.

The following configurations were performed on SunOS 4.0 which has similar configurations with the Unix operating systems implemented by other vendors.

# Execute the following commands as a root user.

```
# mkdir /var/log/3Com
# touch /var/log/3Com/information
```

# Edit the file /etc/syslog.conf as a root user and add the following selector/action pairs.

```
# 3Com configuration messages
local4.info    /var/log/3Com/information
```

# After the log file **information** has been created and the configuration file /etc/syslog.conf has been modified, ensure that the configuration file /etc/syslog.conf is reread by executing the following commands:

```
# ps -ae | grep syslogd
147
# kill -HUP 147
```

Complete Configuration

- Configuration on the switch.

```
#
 info-center source ARP channel 2 trap state off
 info-center source IP channel 2 trap state off
 undo info-center source default channel 2
 info-center loghost 202.38.1.10 facility local4
```

- Configuration on the log host.

```
#
# mkdir /var/log/3Com
# touch /var/log/3Com/information
# 3Com configuration messages
local4.info    /var/log/3Com/information
#
# ps -ae | grep syslogd
147
# kill -HUP 147
```

Precautions

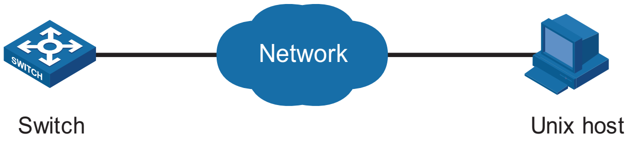
Note the following issues while editing the /etc/syslog.conf file:

- Comments must be on a separate line and must begin with the # sign.
- The selector/action pair must be separated with a tab key, rather than a space.
- No redundant spaces are allowed in the file name.
- The device name and the accepted severity of log information specified by the /etc/syslog.conf file must be identical to those configured on the device using the **info-center loghost** and **info-center source** commands; otherwise the log information may not be output properly to the log host.

Outputting Log Information to a Linux Log Host

Network Diagram

Figure 106 Network diagram for outputting log information to a Linux log host



Networking and Configuration Requirements

Send log information to a Linux log host with an IP address of 202.38.1.10; Log information with severity higher than **errors** will be output to the log host; The information source modules are all modules.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

- Configuration on the switch.

# Enable the information center.

```
<3Com> system-view
[3Com] info-center enable
```

# Set the host with an IP address of 202.38.1.10 to be the log host, set the severity to **errors**, and the information source modules to all modules.

```
[3Com] info-center loghost 202.38.1.10 facility local7
[3Com] info-center source default channel loghost log level errors d
ebug state off trap state off
```

- Configuration on the log host.

# Execute the following commands as a root user.

```
# mkdir /var/log/3Com
# touch /var/log/3Com/information
```

# Edit the file /etc/syslog.conf as a root user and add the following selector/action pairs.

```
# 3Com configuration messages
local7.info    /var/log/3Com/information
```

# After the log file information has been created and the /etc/syslog.conf file has been modified, execute the following commands to display the process ID of **syslogd**, terminate a **syslogd** process, and restart **syslogd** using the -r option.

```
# ps -ae | grep syslogd
147
# kill -9 147
# syslogd -r &
```

Complete Configuration

- Configuration on the switch.

```
#
 info-center source default channel 2 log level error trap state off
 info-center loghost 202.38.1.10
```

- Configuration on the log host.

```
#
# mkdir /var/log/3Com
# touch /var/log/3Com/information
# 3Com configuration messages
local7.info    /var/log/3Com/information
#
# ps -ae | grep syslogd
147
# kill -9 147
# syslogd -r &
```

Precautions

Ensure that the **syslogd** process is started with the -r option on a Linux log host.

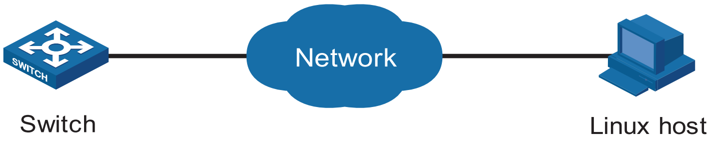
Note the following issues while editing the /etc/syslog.conf file:

- Comments must be on a separate line and must begin with the # sign.
- The selector/action pair must be separated with a tab key, rather than a space.
- No redundant spaces are allowed in the file name.
- The device name and the accepted severity of log information specified by the /etc/syslog.conf file must be identical to those configured on the device using the **info-center loghost** and **info-center source** commands; otherwise the log information may not be output properly to the log host.

Outputting Log and Trap Information to a Log Host Through the Same Channel

Network Diagram

Figure 107 Network diagram for outputting log and trap information to a log host through the same channel



Networking and Configuration Requirements

Send log and trap information with severity higher than **informational** to the log host through the same channel **channel6**. The information source module is L2INF (interface management module).

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

- Configuration on the switch.

# Enable the information center.

```
<3Com> system-view
[3Com] info-center enable
```

# The system outputs information of all modules through channel6 by default. Therefore, you need to disable the function first.

```
[3Com] undo info-center source default channel channel6
```

# Set the host with an IP address of 10.153.116.65 to be the log host, set to send log and trap information with severity higher than **informational** to the log host through the same channel **channel6**, and set the information source module to L2INF.

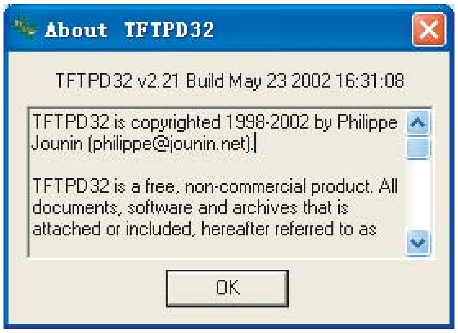
```
[3Com] info-center loghost 10.153.116.65 channel 6
[3Com] info-center source L2INF channel 6 log level informational st
ate on trap level informational state on debug state off
```

- Configuration on the log host.

For the configuration of the log host, see "Configuration Procedure" on page 311 and "Configuration Procedure" on page 313.

The following takes receiving log information through log host software on a Windows operating system as an example:

# The log host software used in this example is TFTPD32, the version of which is as follows:



About TFTPD32

TFTPD32 v2.21 Build May 23 2002 16:31:08

TFTPD32 is copyrighted 1998-2002 by Philippe Jounin (philippe@jounin.net).

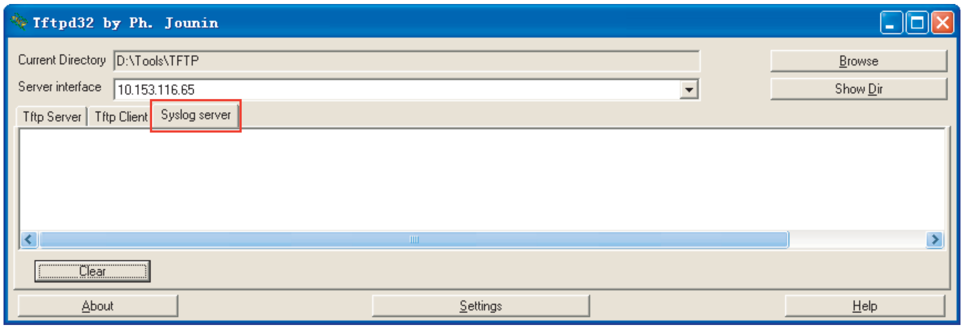
TFTPD32 is a free, non-commercial product. All documents, software and archives that is attached or included, hereafter referred to as

# Open the TFTPD32 application program on the Windows operating system as shown in the following figure:

1 **Current Directory** indicates the directory of the log file **syslog.txt**. You can click the **Browse** button to set it. In this example, the directory is D:ToolsTFTP.

2 **Server interface** indicates the IP address of the log host. It is 10.153.116.65 in this example.

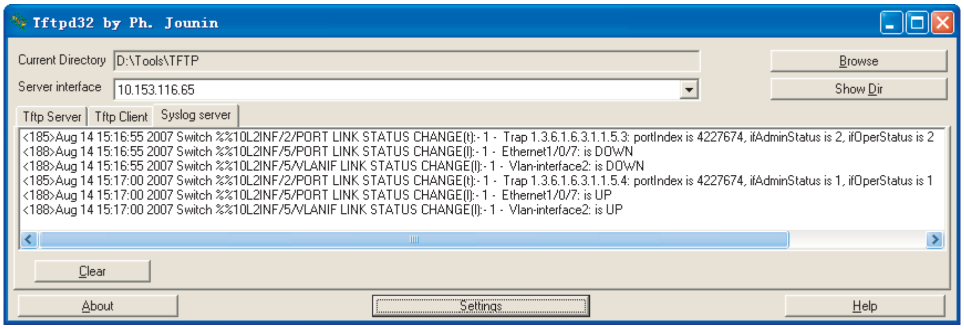
3 Select the **syslog server** tab.



Current Directory D:\Tools\TFTP

Server interface 10.153.116.65

# The system information with the required severity level will be output to the log host as shown in the following figure:

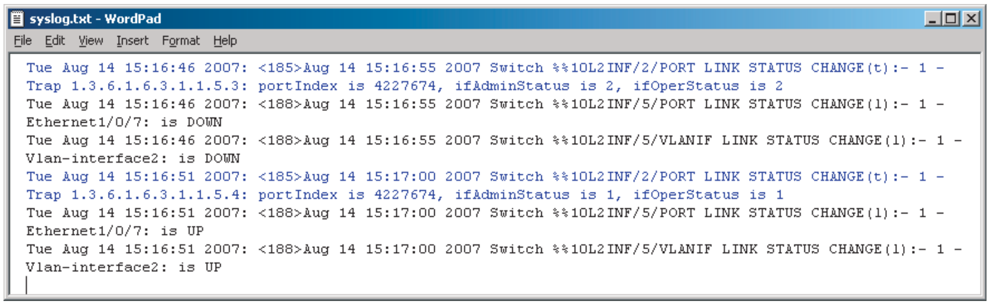


Current Directory D:\Tools\TFTP

Server interface 10.153.116.65

```
<185>Aug 14 15:16:55 2007 Switch %%10L2INF/2/PORT LINK STATUS CHANGE(t):- 1 -  Trap 1.3.6.1.6.3.1.1.5.3: portIndex is 4227674, ifAdminStatus is 2, ifOperStatus is 2
<188>Aug 14 15:16:55 2007 Switch %%10L2INF/5/PORT LINK STATUS CHANGE(l):- 1 -  Ethernet1/0/7: is DOWN
<188>Aug 14 15:16:55 2007 Switch %%10L2INF/5/VLANIF LINK STATUS CHANGE(l):- 1 -  Vlan-interface2: is DOWN
<185>Aug 14 15:17:00 2007 Switch %%10L2INF/2/PORT LINK STATUS CHANGE(t):- 1 -  Trap 1.3.6.1.6.3.1.1.5.4: portIndex is 4227674, ifAdminStatus is 1, ifOperStatus is 1
<188>Aug 14 15:17:00 2007 Switch %%10L2INF/5/PORT LINK STATUS CHANGE(l):- 1 -  Ethernet1/0/7: is UP
<188>Aug 14 15:17:00 2007 Switch %%10L2INF/5/VLANIF LINK STATUS CHANGE(l):- 1 -  Vlan-interface2: is UP
```

# After receiving the system information, the log host will save it in the log file **syslog.txt** under D:ToolsTFTP. You can view the saved system information as shown in the following figure (the information in the blue colour is the L2INF module trap information received by the log host):



```
Tue Aug 14 15:16:46 2007: <185>Aug 14 15:16:55 2007 Switch %%10L2INF/2/PORT LINK STATUS CHANGE(t):- 1 -
Trap 1.3.6.1.6.3.1.1.5.3: portIndex is 4227674, ifAdminStatus is 2, ifOperStatus is 2
Tue Aug 14 15:16:46 2007: <188>Aug 14 15:16:55 2007 Switch %%10L2INF/5/PORT LINK STATUS CHANGE(l):- 1 -
Ethernet1/0/7: is DOWN
Tue Aug 14 15:16:46 2007: <188>Aug 14 15:16:55 2007 Switch %%10L2INF/5/VLANIF LINK STATUS CHANGE(l):- 1 -
Vlan-interface2: is DOWN
Tue Aug 14 15:16:51 2007: <185>Aug 14 15:17:00 2007 Switch %%10L2INF/2/PORT LINK STATUS CHANGE(t):- 1 -
Trap 1.3.6.1.6.3.1.1.5.4: portIndex is 4227674, ifAdminStatus is 1, ifOperStatus is 1
Tue Aug 14 15:16:51 2007: <188>Aug 14 15:17:00 2007 Switch %%10L2INF/5/PORT LINK STATUS CHANGE(l):- 1 -
Ethernet1/0/7: is UP
Tue Aug 14 15:16:51 2007: <188>Aug 14 15:17:00 2007 Switch %%10L2INF/5/VLANIF LINK STATUS CHANGE(l):- 1 -
Vlan-interface2: is UP
```

Complete Configuration

```
#
 info-center source L2INF channel 6
 undo info-center source default channel 6
 info-center loghost 10.153.116.65 channel 6
```

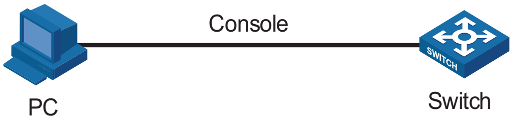
Precautions

On the Windows operating system, software settings vary with log host software.

Outputting Log Information to the Console

Network Diagram

Figure 108 Network diagram for outputting log information to the console



Networking and Configuration Requirements

Log information with a severity higher than **informational** will be output to the console, and the information source modules are ARP and IP.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

Enable the information center.

```
<3Com> system-view
[3Com] info-center enable
```

# By default, the system outputs information of all modules to the console. Therefore, to obtain the system information of the ARP and IP modules, you need to disable the output of information of all modules to the console.

```
[3Com] undo info-center source default channel console
```

# Set the severity to **informational**, and the information source modules to ARP and IP.

```
[3Com] info-center console channel console
[3Com] info-center source arp channel console log level informationa
l debug state off trap state off
[3Com] info-center source ip channel console log level informational
 debug state off trap state off
```

# Enable terminal display.

```
<3Com> terminal monitor
<3Com> terminal logging
```

Complete Configuration

```
#
 info-center source ARP channel 0 trap state off
```

```
info-center source IP channel 0 trap state off
undo info-center source default channel 0
```

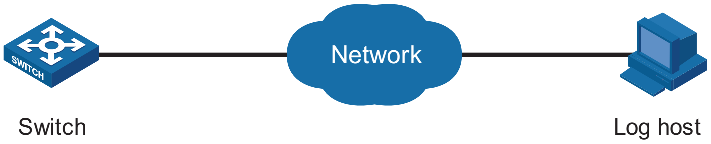
Precautions

None

Displaying the Time Stamp with the UTC Time Zone

Network Diagram

Figure 109 Network diagram for displaying the time stamp with the UTC time zone



Networking and Configuration Requirements

- The switch is in the time zone of GMT+ 08:00:00.
- The time stamp format of output log information is **date**.
- UTC time zone will be added to the output information of the information center.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

Name the local time zone **z8** and set it to eight hours ahead of UTC time.

```
<3Com> clock timezone z8 add 08:00:00
```

# Set the time stamp format of output log information to **date**.

```
<3Com> system-view
[3Com] info-center timestamp loghost date
```

# Configure to add UTC time to the output information of the information center.

```
[3Com] info-center timestamp utc
```

Complete Configuration

```
#
info-center timestamp utc
```

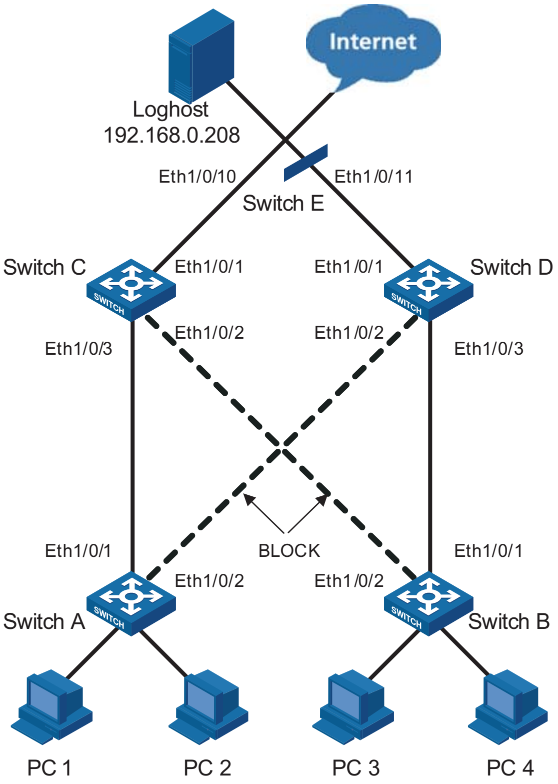
Precautions

None

Use of the Facility Argument in Log Information Output

Network Diagram

Figure 110 Network diagram for use of the facility argument in log information output



Networking and Configuration Requirements

Multiple switches in a LAN send log information to the same log host. You can know the running status of each switch by displaying log information received.

Network Requirements Analysis

As multiple switches send log information to the same log host, you can set different values of the **facility** keyword for each switch to filter information on the log host, thus avoiding failure in recognizing information source (for example, if the two hosts have the same name and the facility keywords are set to the default value local7, you cannot recognize the information source.).

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

- Perform the following configurations on Switch A.

```
[SwitchA]info-center enable
[SwitchA]info-center source default channel loghost log level debugging
[SwitchA]info-center loghost 192.168.0.208 facility local0 channel loghost
```

- Perform the same configurations on Switch B, Switch C, Switch D and Switch E, and specify the facility argument as local1, local2, local3 and local4 respectively.
- You can know the running status of all the devices by filtering information through the **facility** keyword.

Complete Configuration

- Configuration on Switch A.

```
#
 info-center source default channel 2 log level debugging
 info-center loghost 192.168.0.208 facility local0
```

- Configuration on Switch B, Switch C, Switch D and Switch E.

<Omitted>

Precautions

The log host must support the information filtering with the facility keyword function.

35 VLAN-VPN Configuration Guide

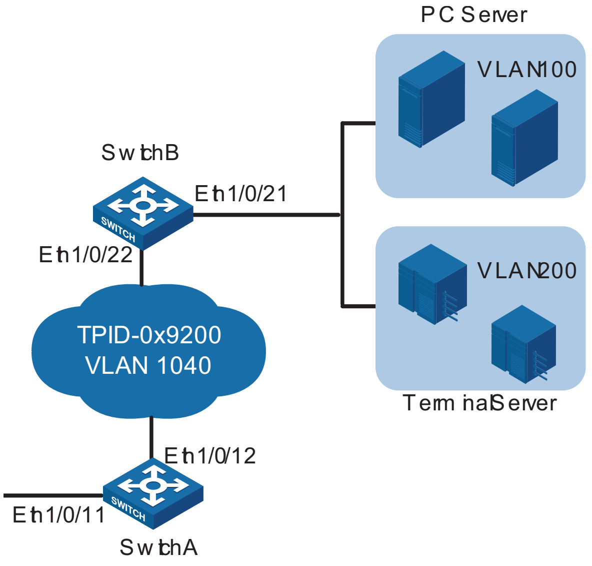
Configuring VLAN-VPN

With VLAN-VPN enabled, a device tags a private network packet with an outer VLAN tag, thus enabling the packet to be transmitted through the service providers' backbone network with both inner and outer VLAN tags. After reaching the peer private network, the packet's outer VLAN tag will be removed and the inner tag will be used for packet forwarding.

VLAN-VPN tunnels private network packets over the public backbone network in a simple way.

Network Diagram

Figure 111 Network diagram for configuring VLAN-VPN



Networking and Configuration Requirements

As shown in Figure 111, Switch A and Switch B are both Switch 5500s. They connect the users to the servers through the public network.

- The PC users and PC servers are in VLAN 100, while the terminal users and terminal servers are in VLAN 200. Both VLAN 100 and VLAN 200 are private. On the public network, there is VLAN 1040.
- Switches of other vendors are used on the public network. They use the TPID value 0x9200.

Only the Switch 5500 supports the configuration of TPID. The Switch 5500G and the Switch 4210 do not support that configuration.

- Configure VLAN-VPN on Switch A and Switch B to enable the PC users and the terminal users to communicate with their respective servers.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

VLAN-VPN is mutually exclusive with each of the following functions

- *GVRP*
- *NTDP*
- *STP*
- *802.1x*
- *MAC authentication*
- *XRN Fabric*

By default, NTDP and STP are enabled on a port. You need to disable the two features using the undo ntdp enable and stp disable commands before enabling VLAN-VPN on the port.

- Configure Switch A

# Enable VLAN-VPN on Ethernet 1/0/11 of Switch A, using the tag of VLAN 1040 as the outer VLAN tag for packets received on the port.

```
<SwitchA> system-view
[SwitchA] vlan 1040
[SwitchA-vlan1040] port Ethernet 1/0/11
[SwitchA-vlan1040] quit
[SwitchA] interface Ethernet 1/0/11
[SwitchA-Ethernet1/0/11] undo ntdp enable
[SwitchA-Ethernet1/0/11] stp disable
[SwitchA-Ethernet1/0/11] vlan-vpn enable
```

# Set the TPID value of Ethernet 1/0/11 to 0x9200 for intercommunication with the devices in the public network.

```
[SwitchA-Ethernet1/0/11] vlan-vpn tpid 9200
[SwitchA-Ethernet1/0/11] quit
```

# Configure Ethernet 1/0/12 as a trunk port that permits tagged packets of VLAN 1040.

```
[SwitchA] interface Ethernet 1/0/12
[SwitchA-Ethernet1/0/12] port link-type trunk
[SwitchA-Ethernet1/0/12] port trunk permit vlan 1040
```

# Set the TPID value of Ethernet 1/0/12 to 0x9200.

```
[SwitchA-Ethernet1/0/12] vlan-vpn tpid 9200
```

- Configure Switch B

# Enable VLAN-VPN on Ethernet 1/0/21 of Switch B, using the tag of VLAN 1040 as the outer VLAN tag for packets received on this port.

```
<SwitchB> system-view
[SwitchB] vlan 1040
[SwitchB-vlan1040] port Ethernet 1/0/21
[SwitchB-vlan1040] quit
[SwitchB] interface Ethernet 1/0/21
[SwitchB-Ethernet1/0/21] undo ntdp enable
[SwitchB-Ethernet1/0/21] stp disable
[SwitchB-Ethernet1/0/21] vlan-vpn enable
```

# Set the TPID value of Ethernet 1/0/21 to 0x9200 for intercommunication with the devices in the public network.

```
[SwitchB-Ethernet1/0/21] vlan-vpn tpid 9200
[SwitchB-Ethernet1/0/21] quit
```

# Configure Ethernet 1/0/22 as a trunk port that permits tagged packets of VLAN 1024.

```
[SwitchA] interface Ethernet 1/0/22
[SwitchA-Ethernet1/0/22] port link-type trunk
[SwitchA-Ethernet1/0/22] port trunk permit vlan 1040
```

# Set the TPID value of Ethernet 1/0/22 to 0x9200.

```
[SwitchA-Ethernet1/0/22] vlan-vpn tpid 9200
```

- Configure the devices in the public network

# As the devices in the public network are from other vendors, only a basic principle is introduced here. That is, you need to configure the devices connecting to Ethernet 1/0/12 of Switch A and Ethernet 1/0/22 of Switch B to permit tagged packets of VLAN 1040.

Complete Configuration

- Configure Switch A

```
#
vlan 1040
#
interface Ethernet1/0/11
port access vlan 1040
 undo ntdp enable
 stp disable
 vlan-vpn enable
 vlan-vpn tpid 9200
#
interface Ethernet1/0/12
 port link-type trunk
 port trunk permit vlan 1 1040
vlan-vpn tpid 9200
```

- Configure Switch B

```
#
vlan 1040
#
interface Ethernet1/0/21
port access vlan 1040
 undo ntdp enable
 stp disable
 vlan-vpn enable
 vlan-vpn tpid 9200
#
interface Ethernet1/0/22
 port link-type trunk
 port trunk permit vlan 1 1040
vlan-vpn tpid 9200
```

Precautions

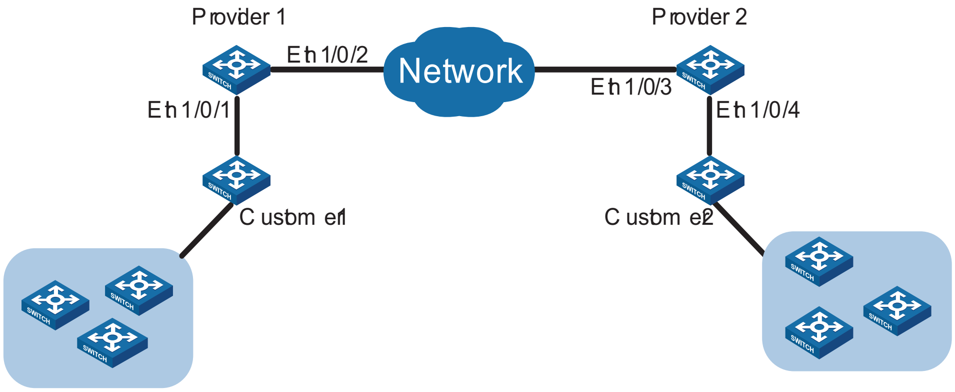
- Do not configure VLAN 1040 as the default VLAN of Ethernet 1/0/12 of Switch A or Ethernet 1/0/22 of Switch B. Otherwise, the outer tag will be removed before a packet is transmitted.
- This example assumes that Ethernet 1/0/11 of Switch A and Ethernet 1/0/21 of Switch B are both access ports. If the two ports are trunk or hybrid ports, specify the default VLAN of the two ports as VLAN 1040, and configure the ports to send untagged packets of VLAN 1040. For detailed information, refer to "Port Basic Configuration" in the *Configuration Guide* for your product.

Configuring BPDU Tunnel

With the BPDU tunnel feature, a switch can transmit Layer 2 protocol packets (NDP packets in this example) along tunnels established on the public network, implementing unified network calculation and maintenance for the private networks connected through the public network.

Network Diagram

Figure 112 Network diagram for configuring BPDU tunnel



Networking and Configuration Requirements

- Customer 1 and Customer 2 are customer side devices, while Provider 1 and Provider 2 are edge devices of the service provider. Customer 1 and Customer 2 are connected to Ethernet 1/0/1 of Provider 1 and Ethernet 1/0/4 of Provider 2 respectively.
- Provider 1 and Provider 2 are connected through trunk a link, which permits packets of all VLANs.

- Configure the service provider network to transmit NDP packets of the customer network through a BPDU tunnel.
- Enable VLAN-VPN for the service provider network, and enable the service provider network to use VLAN 100 to transmit data packets of the customer network.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

- Configure Provide 1.

# Disable NDP on Ethernet 1/0/1.

```
<3Com> system-view
[3Com] interface Ethernet 1/0/1
[3Com-Ethernet1/0/1] undo ndp enable
```

# Enable the BPDU tunnel feature for NDP BPDUs on Ethernet 1/0/1.

```
[3Com-Ethernet1/0/1] bpdu-tunnel ndp
```

# Enable the VLAN-VPN feature on Ethernet 1/0/1 and use VLAN 100 to tunnel user data packets.

```
[3Com-Ethernet1/0/1] port access vlan 100
[3Com-Ethernet1/0/1] vlan-vpn enable
```

# Configure Ethernet 1/0/2 as a trunk port that permits packets of VLAN 100.

```
[3Com] interface Ethernet 1/0/2
[3Com-Ethernet1/0/2] port link-type trunk
[3Com-Ethernet1/0/2] port trunk permit vlan 100
```

- Configure Provide 2

# Disable NDP on Ethernet 1/0/4.

```
<3Com> system-view
[3Com] interface Ethernet 1/0/4
[3Com-Ethernet1/0/4] undo ndp enable
```

# Enable BPDU tunnel for NDP BPDUs on Ethernet 1/0/4.

```
[3Com-Ethernet1/0/4] bpdu-tunnel ndp
```

# Enable the VLAN-VPN feature on Ethernet 1/0/4 and use VLAN 100 to tunnel user data packets.

```
[3Com-Ethernet1/0/4] port access vlan 100
[3Com-Ethernet1/0/4] vlan-vpn enable
```

# Configure Ethernet 1/0/3 as a trunk port that permits packets of VLAN 100.

```
[3Com] interface Ethernet 1/0/3
[3Com-Ethernet1/0/3] port link-type trunk
[3Com-Ethernet1/0/3] port trunk permit vlan 100
```

Complete Configuration

- Configure Provider 1

```
#
interface Ethernet1/0/1
 undo ndp enable
 port access vlan 100
 vlan-vpn enable
 bpdu-tunnel ndp
#
interface Ethernet1/0/2
 port link-type trunk
 port trunk permit vlan 1 100
#
```

- Configure Provider 2

```
#
interface Ethernet1/0/3
 port link-type trunk
 port trunk permit vlan 1 100
#
interface Ethernet1/0/4
undo ndp enable
 port access vlan 100
 vlan-vpn enable
 bpdu-tunnel ndp
#
```

Precautions

None

36 REMOTE-PING CONFIGURATION GUIDE

Remote-ping Configuration

Remote-ping is a network diagnostic tool. It is used to test the performance of various protocols running in networks. Remote-ping provides more functions than the **ping** command.

The **ping** command can only use the Internet Control Message Protocol (ICMP) to test the round trip time (RTT) between the local end and a specified destination end for you to judge whether the destination end is reachable.

A Remote-ping test group is a set of Remote-ping test parameters. A test group contains several test parameters and is uniquely identified by an administrator name and a test operation tag.

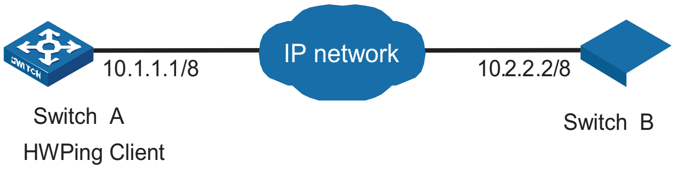
After creating a Remote-ping test group and configuring the test parameters, you can perform a Remote-ping test with the **test-enable** command.

Different from the **ping** command, Remote-ping does not display the RTT or timeout status of each packet on the console terminal in real time. To view the statistic results of your Remote-ping test operation, you need to execute the **display pemote-ping** command. Remote-ping also allows you to set parameters for Remote-ping test groups, start Remote-ping tests and view statistical test results through a network management device.

ICMP Test

Network diagram

Figure 113 Network diagram for the ICMP test



Networking and configuration requirements

A Remote-ping ICMP test between two switches uses ICMP to test the round trip time (RTT) for packets generated by the Remote-ping client.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration procedure

# Enable the Remote-ping client.

```
<3Com> system-view
System View: return to User View with Ctrl+Z.
[3Com] remote-ping-agent enable
```

# Create a Remote-ping test group, configuring the administrator name as **administrator** and test operation tag as **ICMP**.

```
[3Com] remote-ping administrator icmp
```

# Configure the test type as **ICMP**.

```
[3Com-remote-ping-administrator-icmp] test-type icmp
```

# Configure the destination IP address as 10.2.2.2.

```
[3Com-remote-ping-administrator-icmp] destination-ip 10.2.2.2
```

# Configure the number of probes in one test as 10.

```
[3Com-remote-ping-administrator-icmp] count 10
```

# Configure the probe timeout time as 5 seconds.

```
[3Com-remote-ping-administrator-icmp] timeout 5
```

# Start the test.

```
[3Com-remote-ping-administrator-icmp] test-enable
```

# View the test results.

```
[3Com-remote-ping-administrator-icmp] display remote-ping results ad
ministrator icmp
[3Com-remote-ping-administrator-icmp] display remote-ping history ad
ministrator icmp
```

For detailed output description, see the corresponding command manual.

Complete configuration

Configuration on Switch A.

```
#
remote-ping-agent enable
remote-ping administrator icmp
 test-type icmp
 destination-ip 10.2.2.2
 count 10
 timeout 5
```

Precautions

None

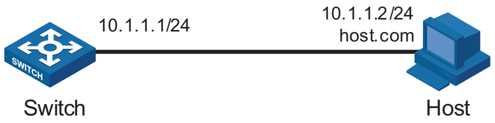
37 DNS CONFIGURATION GUIDE

Static Domain Name Resolution Configuration Guide

Static domain name resolution is based on manually configured domain name-to-IP address mappings. If you telnet a remote device using its name, the local device will look up the corresponding IP address in the static domain name resolution table.

Network Diagram

Figure 114 Network diagram for static domain name resolution configuration



Networking and Configuration Requirements

As shown in the above figure, the switch can use static domain name resolution to access host 10.1.1.2 through domain name host.com.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions
Switch 4210	Release V03.01.00	All versions

Configuration Procedure

Map host name host.com to IP address 10.1.1.2.

```
<3Com> system-view
[3Com] ip host host.com 10.1.1.2
```

# Execute the **ping host.com** command to verify that Switch can get the IP address 10.1.1.2 of name host.com.

```
[3Com] ping host.com
  PING host.com (10.1.1.2): 56  data bytes, press CTRL_C to break
    Reply from 10.1.1.2: bytes=56 Sequence=1 ttl=127 time=3 ms
    Reply from 10.1.1.2: bytes=56 Sequence=2 ttl=127 time=3 ms
    Reply from 10.1.1.2: bytes=56 Sequence=3 ttl=127 time=2 ms
    Reply from 10.1.1.2: bytes=56 Sequence=4 ttl=127 time=5 ms
    Reply from 10.1.1.2: bytes=56 Sequence=5 ttl=127 time=3 ms

  --- host.com ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 2/3/5 ms
```

Complete Configuration

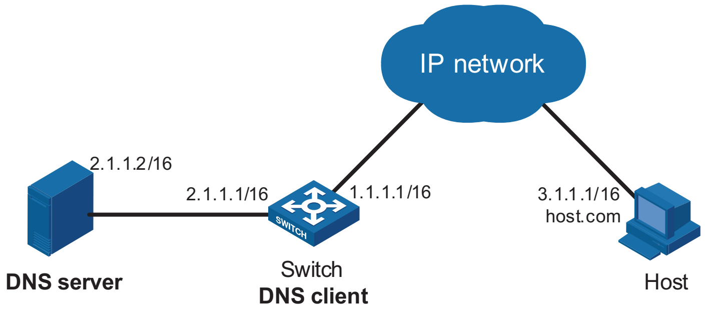
```
#
 ip host host.com 10.1.1.2
```

Dynamic Domain Name Resolution Configuration Guide

Domain Name System (DNS) is a distributed database used by TCP/IP applications to translate domain names into corresponding IP addresses. With DNS, you can use easy-to-remember domain names in some applications and let the DNS server translate them into correct IP addresses.

Network Diagram

Figure 115 Network diagram for dynamic domain name resolution configuration



Networking and Configuration Requirements

- Switch serves as a DNS client to access the host at 3.1.1.1/16 through domain name **host**.
- The DNS server has the IP address 2.1.1.2/16. The domain name suffix is **com**.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

Enable dynamic domain name resolution.

```
<3Com> system-view
[3Com] dns resolve
```

# Specify the DNS server 2.1.1.2.

```
[3Com] dns server 2.1.1.2
```

# Configure **com** as the DNS suffix.

```
[3Com] dns domain com
```

Execute the **ping host** command on Switch. The ping is successful and the corresponding IP address is 3.1.1.1.

```
[3Com] ping host
 Trying DNS server (2.1.1.2)
```

```
  PING host.com (3.1.1.1): 56  data bytes, press CTRL_C to break
    Reply from 3.1.1.1: bytes=56 Sequence=1 ttl=125 time=4 ms
    Reply from 3.1.1.1: bytes=56 Sequence=2 ttl=125 time=4 ms
    Reply from 3.1.1.1: bytes=56 Sequence=3 ttl=125 time=4 ms
    Reply from 3.1.1.1: bytes=56 Sequence=4 ttl=125 time=4 ms
    Reply from 3.1.1.1: bytes=56 Sequence=5 ttl=125 time=5 ms

--- host.com ping statistics ---
    5 packet(s) transmitted
    5 packet(s) received
    0.00% packet loss
    round-trip min/avg/max = 4/4/5 ms
```

Complete Configuration

```
#
 dns resolve
 dns server 2.1.1.2
 dns domain com
```

Precautions

- The routes between the DNS server, Switch, and Host are reachable. Necessary configurations are done on the devices.
- There is a mapping between domain name **host** and IP address 3.1.1.1/16 on the DNS server. The DNS server works normally.

38 ACCESS MANAGEMENT CONFIGURATION GUIDE

Configuring Access Management

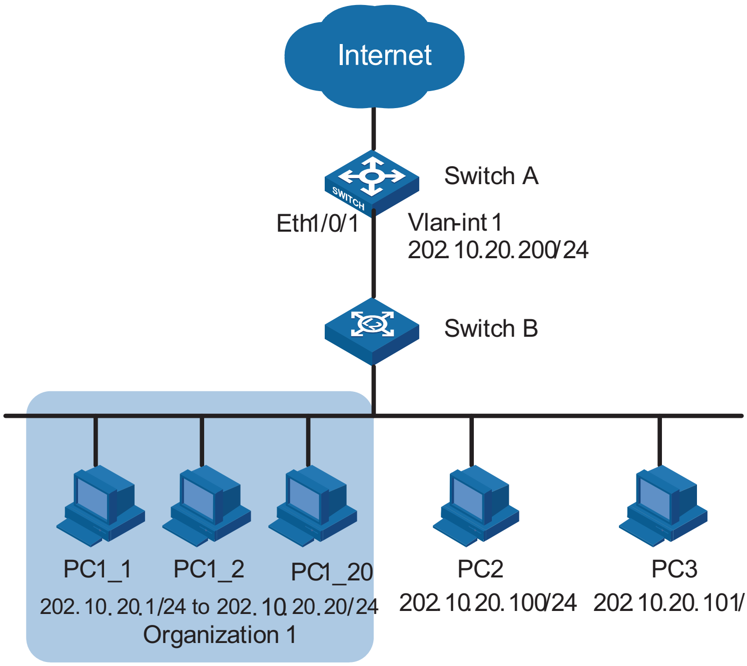
The access management function is designed to control user accesses on access switches. It allows you to control the access of hosts to external networks.

The idea is to bind a range of IP addresses to a port by configuring an access management IP address pool on the port.

- If an access management IP address pool is available on a port, a host connected to the port can access external networks only when its IP address is contained in the address pool.
- If no access management IP address pool is available on a port, a host connected to the port can access external networks so long as its IP address is not in the access management IP address pools of any other switch port.

Network Diagram

Figure 116 Network diagram for access management configuration



Networking and Configuration Requirements

Client PCs access the Internet through Switch A. The IP addresses of PCs belonging to organization 1 are in the range of 202.10.20.1/24 to 202.10.20.20/24, the IP address of PC 2 is 202.10.20.100/24, and the IP address of PC 3 is 202.10.20.101/24.

- Permit all the PCs of organization 1 to access the Internet through Ethernet 1/0/1 on Switch A. Ethernet 1/0/1 carries VLAN 1. The IP address assigned to the interface of VLAN 1 is 202.10.20.200/24.
- PCs that do not belong to organization 1, such as PC 2 and PC 3, are not allowed to access the Internet through Ethernet 1/0/1 on Switch A.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

Enable access management on Switch A.

```
[SwitchA] am enable
```

# Configure the IP address of VLAN-interface 1 as 202.10.20.200/24.

```
[SwitchA] interface Vlan-interface 1
[SwitchA-Vlan-interface1] ip address 202.10.20.200 24
[SwitchA-Vlan-interface1] quit
```

# Configure an access management IP address pool for Ethernet 1/0/1.

```
[SwitchA] interface Ethernet 1/0/1
[SwitchA-Ethernet1/0/1] am ip-pool 202.10.20.1 20
```

Complete Configuration

```
#
 am enable
#
interface Vlan-interface1
 ip address 202.10.20.200 255.255.255.0
#
interface Ethernet1/0/1
am ip-pool 202.10.20.1 20
#
```

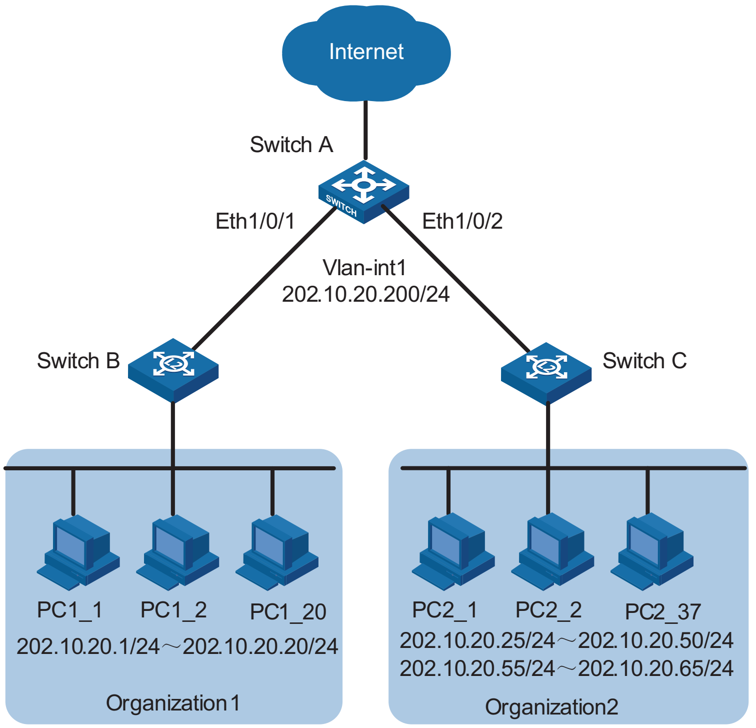
Precautions

- The IP addresses in the access management IP address pool configured for a port must be on the same segment as the VLAN-interface IP address of the VLAN to which the port belongs.
- If the access management IP address pool to be configured for a port contains an IP address in a static ARP entry of another port, the system will ask you to delete the ARP entry to ensure that the access management IP address pool can take effect.
- To allow only the hosts bound with a port and with their IP addresses in the access management IP address pool of the port to access external networks, configure static ARP entries only for IP addresses in the address pool.

Configuring Access Management with Port Isolation

Network Diagram

Figure 117 Network diagram for access management and port isolation configuration



Networking and Configuration Requirements

Client PCs are connected to the Internet through Switch A. The IP address range for organization 1 is 202.10.20.1/24 to 202.10.20.20/24; and the IP address ranges for organization 2 are 202.10.20.25/24 to 202.10.20.50/24 and 202.10.20.55/24 to 202.10.20.65/24.

- PCs of organization 1 are allowed to access the Internet through Ethernet 1/0/1 of Switch A.
- PCs of organization 2 are allowed to access the Internet through Ethernet 1/0/2 of Switch A.
- Both Ethernet 1/0/1 and Ethernet 1/0/2 belong to VLAN 1, and the IP address of VLAN-interface 1 is 202.10.20.200/24.
- PCs of organization 1 are isolated from those of organization 2 at Layer 2.

Applicable Products

Product series	Software version	Hardware version
Switch 5500	Release V03.02.04	All versions
Switch 5500G	Release V03.02.04	All versions
Switch 4500	Release V03.03.00	All versions

Configuration Procedure

Enable access management on Switch A.

```
[SwitchA] am enable
```

# Configure the IP address of VLAN-interface 1 as 202.10.20.200/24.

```
[SwitchA] interface Vlan-interface 1
[SwitchA-Vlan-interface1] ip address 202.10.20.200 24
[SwitchA-Vlan-interface1] quit
```

# Configure an access management IP address pool for Ethernet 1/0/1.

```
[SwitchA] interface Ethernet 1/0/1
[SwitchA-Ethernet1/0/1] am ip-pool 202.10.20.1 20
```

# Add Ethernet 1/0/1 to the isolation group.

```
[SwitchA-Ethernet1/0/1] port isolate
[SwitchA-Ethernet1/0/1] quit
```

# Configure an access management IP address pool for Ethernet 1/0/2.

```
[SwitchA] interface Ethernet 1/0/2
[SwitchA-Ethernet1/0/2] am ip-pool 202.10.20.25 26 202.10.20.55 11
```

# Add Ethernet 1/0/2 to the isolation group.

```
[SwitchA-Ethernet1/0/2] port isolate
[SwitchA-Ethernet1/0/2] quit
```

Complete Configuration

```
#
 am enable
#
interface Vlan-interface1
 ip address 202.10.20.200 255.255.255.0
#
interface Ethernet1/0/1
 port isolate
 am ip-pool 202.10.20.1 20
#
interface Ethernet1/0/2
 port isolate
 am ip-pool 202.10.20.25 26 202.10.20.55 11
#
```

Precautions

Refer to “Precautions” on page 334 for details.